1.2.1(2)

Certified List of Courses for 2021-22

NRIINSTITUTEOFTECHNOLOGY

Pothavarappadu(v),Agiripalli(M)VijayawadaRural-521212

1.2.1(2)-Certified List of New Courses along with the Highlighted Course Structure for the A.Y. 2021-22

1.1.3 & 1.2.1

NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING NRIA 18

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Schemeof Instruction (Periods PerWeek)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A4101401	Pre-stressed concrete Structures	2	1	0	3	40	60	100	3
2	18A4101402	Design of steel structures	2	1	0	3	40	60	100	3
3	18A4101403	Construction Technology & Project Management	2	0	0	2	40	60	100	2
4	18A4101404	Quantity Surveying & Public works	2	1	0	3	40	60	100	3
5		**Professional Elective -4**	3	0	0	3	40	60	100	3
	18A41015111	Finite Element Methods								
	8A4101512	Advanced FoundationEngineering								
	18A4101513	Environmental ImpactAssessment								
	18A4101514	Traffic Engineering								
	18A4101515	Sustainable WaterResources Development								
6		**Open elective -4**	3	0	0	3	40	60	100	2
	18A4101607	Project management								
	18A4101608	Remote sensing and GIS techniques								
7	18A4101491	Structural Designing and drawing using Software's	0	0	3	3	40	60	100	1.5
8	18A4101492	Environmental Engineering Lab	0	0	3	3	40	60	100	1.5
9	18A4101791	Project – I	0	0	6	6	40	60	100	1.5
10	18A4101792	Summer Internship/ Design Project	0	0	0	0	40	60	100	1.5
11	18A4100801	Entrepreneurship	2	0	0	2	40	60	100	0
		Total	**16**	**3**	**12**	**31**	**440**	**660**	**1100**	**23**

Head of The Department
CIVIL ENGINEERING
NRI Institute of Technology
POTHAVARAPPADU.

PRESTRESSED CONCRETE

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Strength of Materials, Structural Analysis

Course Objectives:

1. Analyze PSC beams with straight, concentric, eccentric, bent and parabolic tendons and design beams of rectangular and I sections for flexure.
2. Design shear reinforcements, structural elements for shear, torsion and anchorage as per the provisions of BIS.
3. Interpret the transmission mechanism of pre-stressing force by bond and compute deflection of beams under loads

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the concepts of pre-stressing and methods of pre stressing.
CO2	Compute losses of pre-stress in pre-stressed concrete members.
CO3	Design PSC beams under flexure.
CO4	Design PSC beams under shear.
CO5	Determine the short and long term deflections of PSC beams
CO6	Implement prestressing concepts for composite beams.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	-	-	3	-	-	-	-
CO2	3	3	3	-	-	-	-	3	-	-	-	-
CO3	3	3	3	-	-	-	-	3	-	-	-	-
CO4	3	3	3	-	-	-	-	3	-	-	-	-
CO5	3	3	3	-	-	-	-	3	-	-	-	-
CO6	2	2	2	-	-	-	-	2	-	-	-	-

UNIT I

Principles of Pre-Stressing:

Principles of pre-stressing – pre stressing systems - pre-tensioning and post tensioning- Advantages and limitations of Pre stressed concrete- need for high strength materials. Methods of pre-stressing: Pre-tensioning (Hoyer system) and Post-tensioning methods (Freyssinet system and Gifford- Udall System).

LO: 1. Understand pre tensioning and post tensioning

2. Identify different type of prestressing system

UNIT II

Losses of pre-stress:

Loss of pre-stress in pre-tensioned and post-tensioned members due to elastic shortening, shrinkage and creep of concrete, relaxation of stress in steel, anchorage slip and frictional losses.

LO: 1. Classify different types of losses in prestressing

2. Estimate losses of pre stress

UNIT III

Flexure and shear:

Analysis of beams for flexure and shear - beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons- Kern line - Cable profile - design of PSC beams (rectangular and I sections) using IS 1343. Analysis and design of rectangular and I beams for shear. Introduction to Transmission length and End block (no Design and Analytical problems).

LO: 1. Analyze beams for flexure and shear

2. Understand prestressing with different types of tendons on beams of varying shape

3. Explain end block characteristics and its significance

UNIT IV

Deflections:

Control of deflections- Factors influencing deflections - short term deflections of uncracked beams- prediction of long time deflections.

LO: 1. Distinguish between short term and long term deflections in PSC beams

2. Estimate the short and long term deflections of PSC beam.

Composite beams:

Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams.

LO: 1. Identify different types of composite beams

2. Analyze PSC composite beams.

TEXT BOOKS:

1. Prestressed Concrete, N. Krishna Raju, Tata Mc.Graw Hill Publications.
2. Prestressed Concrete Design, Praveen Nagrajan, Pearson publications, 2013.

REFERENCE BOOKS:

1. Design of Prestressed Concrete Structures, T.Y. Lin & Ned H. Burns, John Wiley & Sons.
2. Prestressed Concrete, S. Ramamrutham, Dhanpatrai Publications.
3. Prestressed concrete, Rajagopalan, Narosa Publishing House.

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/prestressed-concrete-structures.html

DESIGN OF STEEL STRUCTURES

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Reinforced Concrete Structures, Strength of materials

Course Objectives:

1. Analyze PSC beams with straight, concentric, eccentric, bent and parabolic tendons and design beams of rectangular and I sections for flexure.
2. Design shear reinforcements, structural elements for shear, torsion and anchorage as per the provisions of BIS.
3. Interpret the transmission mechanism of pre-stressing force by bond and compute deflection of beams under loads

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Explain different types of Connections and relevant IS code provision.
CO2 Design beams and columns.
CO3 Design of truss elements
CO4 Design of column bases
CO5 Design Plate Girders with curtailment of flanges.
CO6 Design principles of Gantry Girders with curtailment of flanges.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	-	-	3	-	-	-	-
CO2	3	3	3	-	-	-	-	3	-	-	-	-
CO3	3	3	3	-	-	-	-	3	-	-	-	-
CO4	3	3	3	-	-	-	-	3	-	-	-	-
CO5	3	3	3	-	-	-	-	3	-	-	-	-
CO6	2	2	2	-	-	-	-	2	-	-	-	-

UNIT I

Connections:

Riveted connections – Rivet value, Welded connections: Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to in plane and out of plane.

LO: 1. Understand riveted and welded connections

2. Estimate strength of welds

3. Design Welded and reverted connections as per IS Codal provisions

Beams:

Allowable stresses, design of simple beams-Curtailment of flange plates - IS Code-provision - Beam - to - beam connection, shear, buckling, check for deflection and bearing, laterally unsupported beams.

LO: 1. Understand behaviour of simple beams

2. Visualize importance of curtailment of flange plates

3. Design and detail of steel beams under different conditions adopting IS Code.

UNIT II

Tension Members and Compression members:

Design of members in direct tension and bending –effective length of columns. Slenderness ratio – permissible stresses. Design of compression members. Roof Trusses: types of trusses – Design loads – Load combinations as per IS Code, detailing –Design of simple roof trusses elements (purlins, members and joints)

LO: 1. Understand behaviour of tension members

2. Understand behaviour of compression members

3. Design and detail of Tension and compression members under different conditions adopting IS Code.

4. Design simple roof trusses and elements

UNIT III

Design of built-up columns:

Built-up columns with lacing and/or battening system. Design of Eccentrically loaded columns, Splicing of columns.

LO: 1. Understand behaviour of built-up columns

2. Design and detail of built-up columns adopting IS Code.

Design of Column bases:

Slab base and gusseted base under axial load and moment.

LO: 1. Understand behaviour of column bases

2. Design and detail of column bases adopting IS Code.

UNIT IV

Plate Girders:

Design of plate girder – IS code Provisions – Welded – Curtailment of flange plates, stiffeners – splicing and connections.

Gantry Girder:

Design principles of Gantry Girder - impact factors – longitudinal forces.

LO: 1. Identify different components of plate girder

2. Design and detail of components of plate girder confirming to IS Code

3. Understand the functioning of gantry girder for different types of loads

TEXT BOOKS:

1. Steel Structures Design and Practice, N. Subramanian, Oxford University Press.
2. Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, New Delhi.

REFERENCE BOOKS:

1. Structural Design in Steel, Sarwar Alam Raz, New Age International Publishers, New Delhi
2. Design of Steel Structures, M. Raghupathi, Tata Mc. Graw-Hill.
3. Structural Design and Drawing, N. Krishna Raju; University Press.
4. Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi, 2008.
5. IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5), Bureau of Indian standards.
6. Steel Tables.

E-RESOURCES:

- https://www.alljntuworld.in/download/steel-structures-design-drawing-dss-materials-notes/
- http://www.nptelvideos.in/2012/11/design-of-steel-structures.html

CONSTRUCTION TECHNOLOGY & PROJECT MANAGEMENT

Lecture – Tutorial: 2-0Hours
Credits: 2
Internal Marks: 40
External Marks: 60

Prerequisites: Building Materials, Concrete Technology

Course Objectives:

- To introduce to the student the concept of project management including network drawing and monitoring
- To introduce various equipment's like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to constriction.
- To introduce the importance of safety in construction projects

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the importance of construction planning
CO2	Assess the project management and construction techniques
CO3	Describe about project evaluation and review technique.
CO4	Explain the methods of production of aggregate products
CO5	Explain the functioning of various earth moving equipment
CO6	Explain Concreting and usage of machinery required for the works

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	1	-	-	3	-
CO2	1	-	-	-	-	-	-	1	-	-	3	-
CO3	3	-	-	-	-	-	-	1	-	-	3	-
CO4	2	-	-	-	-	-	-	1	-	-	3	-
CO5	1	-	-	-	-	-	-	1	-	-	3	-
CO6	1	-	-	-	-	-	-	1	-	-	3	-

UNIT I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications

Project Evaluation and Review Technique – cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources

UNIT II

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

Hoisting and earthwork equipment – hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

UNIT III

Concreting equipment – crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushing equipment - screening of aggregate – concrete mixers – mixing and placing of concrete – consolidating and finishing

UNIT IV

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering

TEXT BOOKS:

1. Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
2. Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
3. Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

REFERENCE BOOKS:

1. Construction Project Management - An Integrated Approach, Peter Fewings , Taylor and Francis
2. Construction Management Emerging Trends and Technologies, Trefor Williams , Cengage learning.
3. Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.
4. Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgrawhill

E-RESOURCES:

- https://nptel.ac.in/courses/105/103/105103093/

QUANTITY SURVEYING & PUBLIC WORKS

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Building Materials, Concrete Technology

Course Objectives:

1. To impart basic knowledge on different types of estimation
2. To enrich with specifications and tender procedures.
3. To give insights on various types of contract agreements.
4. To inculcate data preparation for abstract estimation
5. To teach procedure for valuation of buildings.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the methods of Estimation
CO2	Evaluate the quantities for structural components
CO3	Prepare detailed and general specifications for a project
CO4	Prepare documents for different types of contracts
CO5	Explain procedures for entries in measurement books and its importance
CO6	Evaluate valuation of buildings.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	2	-	1	-	-	-	-
CO2	3	3	-	-	-	2	-	1	-	-	-	-
CO3	3	2	-	-	-	2	-	1	-	-	-	-
CO4	3	1	-	-	-	2	-	1	-	-	-	-
CO5	3	2	-	-	-	2	-	1	-	-	-	-
CO6	3	2	-	-	-	2	-	1	-	-	-	-

UNIT I

Estimation

Methods of estimation-advantages-types of estimates-detailed estimates of residential buildings-single storied and multi-storeyed buildings-earthwork-foundations-Super structure-Fittings including sanitary and electrical fittings-paintings.

LO: 1. Understand methods of Estimation

2. Carryout estimation of quantities for structural components

3. Estimate cost while using different types of sanitary and electrical fittings

UNIT II

Rate Analysis and Preparation of Bills

Data-Rate analysis-abstract estimate-report to accompany estimate-measurement book –bills-types

LO: 1. Calculate data for different materials

2. Understand procedures for entries in measurement books and its importance

3. Prepare abstract estimates based on SSR.

UNIT III

Specifications and Tenders

Specifications-Detailed and general specifications-construction specifications-sources- types of specifications-Tender notices-types-corrigendum notice-tender procedures Drafting model tenders.

LO: 1. Prepare detailed and general specifications for a project

2. Understand tender schedule and tender notices

3. Draft tender documents for projects

UNIT IV

Contracts

Types of contracts-formation and conditions of contract-problems-contract for labour, material, design and construction-drafting of contract documents-construction contracts- arbitration and legal requirements.

LO: 1. Prepare documents for different types of contracts

2. Identify arbitration and legal issues and mitigation methods

Valuation

Principles of valuation-Value and Cost-value engineering-value analysis-phases in value engineering-information-function-escalation-evaluation-recommendation-implementation-Audit.

LO: 1. Carry out valuation of buildings.

2. Explain Auditing procedures and implementation

TEXT BOOKS:

1. Estimating and Costing in Civil Engineering (Theory & Practice), Dutta, B. N., UBS Publishers, 2016

2. Civil Engineering Contracts and Estimates, B. S. Patil, Universities Press Pvt Ltd, Hyderabad. 4th Edition 2015.

REFERENCE BOOKS:

1. , Estimation, Costing and Specifications, M. Chakraborthi ,Laxmi publications.
2. A Textbook of Estimating and Costing(Civil), S. Chand and Company Limited, D. D. Kohli & R. C. Kohli, New Delhi
3. Standard Schedule of rates and standard data book by public works department.
4. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)

E-RESOURCES:

- http://www.btechmaterials.com/download/estimating-costing-materials-notes/
- https://lecturenotes.in/subject/439/estimating-costing-EC

PROFESSIONAL ELECTIVE-IV

A. FINITE ELEMENT METHODS

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Introduce fundamentals of elasticity and steps involved in FEM.
2. To describe element stiffness matrix formulation for 1D and 2D cases.
3. To impart isoparametric formulation concepts.
4. To teach formulation of stiffness matrix for axi-symmetric problems.
5. To demonstrate numerical solution techniques used in FEM.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Develop finite element formulations of 1D & 2D problems.
CO2	Solve complex problems using FEM.
CO3	Formulate isoparametric elements with different irregular boundaries.
CO4	Implement solution techniques for higher order problems in practice.
CO5	Explain concepts for carrying out research.
CO6	Explain concepts for modelling of non-linear materials and geometry

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	-	1	-	-	-	-
CO2	3	3	-	-	-	-	-	1	-	-	-	-
CO3	3	3	-	-	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	-	-	1	-	-	-	-
CO5	3	-	-	-	-	-	-	1	-	-	-	-
CO6	3	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Basic Concepts of FEM:

Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation. Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with axi-symmetric loading.

LO: 1. Update basic concepts of theory of elasticity

2. Understand stages involved in FEM

UNIT II

One Dimensional & Two Dimensional Elements: Stiffness matrix for bar element – shape functions – 1D and 2D elements – types of elements for plane stress and plane strain analysis – Displacement models – generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates

LO: 1. Study types of elements and their degrees of freedom

2. Develop stiffness matrices for 1D and 2D elements

UNIT III

Element stiffness matrix:

Generation of element stiffness and nodal load matrices for 3-node triangular element and four noded rectangular elements.

LO: 1. Study types of elements and their degrees of freedom

1. ***Develop stiffness matrices for triangular and rectangular elements.***

Solution techniques:

Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

LO: 1. Apply numerical solution techniques in FEM.

UNIT IV

Isoparametric Formulation:

isoparametric elements for 2D analysis –formulation of CST element, 4 – noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

Axi-symmetric analysis: Basic principles-Formulation of 4-noded isoparametric axi-symmetric element

LO: 1. Study types of elements and their degrees of freedom

2. Develop stiffness matrices for 2D and axisymmetric solution techniques.

TEXT BOOKS:

1. Finite Element Analysis for Engineering and Technology, Tirupathi R Chandraputla, Universities Press Pvt Ltd, Hyderabad. 2003.
2. Finite Element analysis-Theory & Programming, C. S. Krishna Murthy, Tata McGraw Hill Publishers.

REFERENCE BOOKS:

1. Finite element analysis and procedures in engineering, H.V. Lakshminaryana, 3rd edition, Universities press, Hyderabad.
2. Robert D. Cook, Michael E Plesha, Concepts and applications of Finite Element Analysis, Robert D. Cook, Michael E Plesha, John Wiley & sons Publications
3. Finite element analysis in Engineering Design, S. Rajasekharan, S. Chand Publications, New Delhi.

E-RESOURCES:

- https://nptel.ac.in/courses/105/107/105107209/

PROFESSIONAL ELECTIVE-IV

B. ADVANCED FOUNDATION ENGINEERING

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives: Soil Mechanics, Foundation Engineering

1. To impart how Meyerhof's general bearing capacity equations are important over Terzaghi's bearing capacity equation.
2. To teach special methods of computation of settlements and the corrections to be applied to settlements and to understand the advanced concepts of design of pile foundations.
3. To throw light on pile and mat foundation designs.
4. To teach the difference between isolated and combined footings, the determination of bearing capacity of mats and proportioning of footings.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Compute the safe bearing capacity of footings subjected to vertical and inclined loads.
CO2	Explain the advanced methods of settlement computations and proportion foundation footings.
CO3	Explain the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.
CO4	Evaluate the problems posed by expansive soils and the different foundation practices devised.
CO5	Differentiate between isolated footings and combined footings and mat foundations.
CO6	Design of piles and pile caps in different soils

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	1	1	-	-	-	-	-	-	-	-	-	-
CO4	3	3	1	-	-	-	-	-	-	-	-	-
CO5	1	1	-	-	-	-	-	-	-	-	-	-
CO6	3	3	3	-	-	-	-	-	-	-	-	-

UNIT I

Concepts of Bearing capacity:

Bearing capacity of Foundations using general bearing capacity equation – Meyerhof's, Brinch Hansen's and Vesic's methods- Bearing capacity of Layered Soils: Strong layer over weak layer, Weak layer on strong layer – Bearing capacity of foundations on a top of slope – Bearing capacity of foundations at the edge of the slope.

LO: 1. Understand bearing capacity of soils

2. Determine the bearing capacity of soils.

UNIT II

Settlement analysis:

Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

LO: 1. Understand settlement analysis by various methods.

2. Study corrections for construction period

UNIT III

Mat foundations

Purpose and types of isolated and combined footings – Mats/ Rafts – Proportioning of footings – Ultimate bearing capacity of mat foundations – allowable bearing capacity of mats founded in clays and granular soils – compensated rafts.

LO: 1. List Mat foundations for various types applications

2. Design mat foundations for different types of soils.

UNIT IV

Pile foundations

Single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

LO: 1. Explain conditions for adopting pile foundations

2. Design piles and pile caps in different soils.

TEXT BOOKS:

1. J. E. Bowles Foundation Analysis and Design, John Wiley
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS Publishers

REFERENCE BOOKS:

1. Foundation Design, W.C. Teng, Prentice Hall Publishers
2. Analysis and Design of Substructures, Saran S.,Taylor & Francis Publishers, 2006
3. Design of Foundation Systems: Principles and Practices, Kurien, N.P., Narosa Publishing House, New Delhi, 1999
4. Pile Foundation Analysis and Design, Poulos, H. G., and Davis, E. H., John Wiley, 1980.

E-RESOURCES:

- https://nptel.ac.in/courses/105/105/105105207/

PROFESSIONAL ELECTIVE-IV

C. ENVIRONMENTAL IMPACT ASSESSMENT

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. To impart knowledge on different concepts of Environmental Impact Assessment
2. To teach procedures of risk assessment
3. To teach the EIA methodologies and the criterion for selection of EIA methods
4. To teach the procedures for environmental clearances and audit

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the role of stakeholder and public hearing in the preparation of EIA.
CO2	Identify the risks and impacts of a project.
CO3	Choose an appropriate EIA methodology.
CO4	Evaluate the EIA report.
CO5	Estimate the cost benefit ratio of a project.
CO6	Prepare EMP, EIS, and EIA report.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	3	-	-	-	-	-
CO2	3	-	-	1	-	-	3	-	-	-	-	-
CO3	3	-	-	1	-	-	3	2	-	-	-	-
CO4	3	-	1	-	-	-	3	-	-	-	-	-
CO5	3	-	2	-	-	-	3	-	-	-	2	-
CO6	3	-	-	1	-	2	3	3	-	-	-	-

UNIT I

Environmental Acts and Notifications:

The Environmental protection Act, The water preservation Act, The Air (Prevention & Control of pollution Act), Wild life Act - Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000.

LO: 1. Understand the importance of environmental protection acts

2. Explain acts and notifications in Environmental legislation

UNIT II

Impact of Developmental Activities and Land Use

Introduction and Methodology for the assessment of soil and ground water, Delineation of study area, Identification of actives. Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures. E I A in surface water, Air and Biological environment: Methodology for the assessment of Impacts on surface water environment, Air pollution sources, Generalized approach for assessment of Air pollution Impact.

LO: 1. Study the factors causing impact of development activities

2. Decide mitigation measures of pollution on environment

UNIT III

Assessment of Impact on Vegetation, Wildlife and Risk Assessment

Introduction - Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation - Risk assessment and treatment of uncertainty-key stages in performing an Environmental Risk Assessment-advantages of Environmental Risk Assessment

LO: 1. Understand effect of development activities on environment.

2. Design procedures for assessment of environmental risk

UNIT IV

Methodologies of EIA

Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters- Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods and cost/benefit Analysis.

LO: 1. Understand the elements of EIA.

2. Explain criteria for selection of EIA methodology

TEXT BOOKS:

1. Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
2. Environmental Impact Assessment Methodologies, Y.Anjaneyulu, B. S. Publication, Hyderabad.

REFERENCE BOOKS:

1. Environmental Engineering, Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985
2. Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers
3. Environmental Science and Engineering, Suresh K. Dhaneja, S.K., Katania & Sons Publication, New Delhi.
4. Environmental Pollution and Control, H. S. Bhatia , Galgotia Publication (P) Ltd, Delhi

E-RESOURCES:

- https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers_Manual/Teacher_manual_master_EIA.pdf
- https://lecturenotes.in/subject/608/environmental-impact-assessment-management

PROFESSIONAL ELECTIVE-IV

D. TRAFFIC ENGINEERING

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. To teach basic science principles in estimating stopping and passing sight distance requirements.
2. Identify and teach traffic stream characteristics
3. Understand elements of highway safety and approaches to accident Studies.
4. To teach the importance of road safety
5. Design a pre-timed signalized intersection, and determine the signal splits.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain principles in estimating stopping and passing sight distance requirements.
CO2	Analyse Traffic Problems And Plan For Traffic Systems Various Uses.
CO3	Conduct different types of Traffic Surveys.
CO4	Explain traffic regulation and control devices.
CO5	Design Channels, Intersections, Signals and Parking Arrangements.
CO6	Develop Traffic Management Systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	-	2	-	-	-	-
CO2	3	2	1	-	-	2	-	2	-	-	-	-
CO3	3	-	-	-	-	2	-	1	-	-	-	-
CO4	3	-	-	-	-	2	-	2	-	-	-	-
CO5	3	3	3	-	-	2	-	1	-	-	-	-
CO6	3	1	-	-	-	2	-	2	-	-	-	-

UNIT I

Traffic Planning and Characteristics:

Road Characteristics-Road user characteristics, PIEV theory, Vehicle Performance characteristics, Fundamentals of Traffic Flow, Urban Traffic problems in India, Integrated planning of town, country, regional and all urban infrastructures, Sustainable approach- land use & transport and modal integration.

LO: 1. Understand the concepts of road and road user characteristics

2. Outline the traffic problems in rural and urban India

3. Suggest sustainable approaches for proper land use and transport

UNIT II

Traffic Surveys: Traffic Surveys- Speed, journey time and delay surveys, Vehicles Volume Survey including non-motorized transports, Methods and interpretation, Origin Destination Survey, Methods and presentation, Parking Survey, Accident analyses-Methods, interpretation and presentation, Statistical applications in traffic studies and traffic forecasting, Level of service- Concept, applications and significance.

LO: 1. Understand importance of traffic surveys
2. List out methods of interpretation of survey data
3. Forecast traffic adopting statistical data
4. Carryout origin and destination surveys

UNIT III

Traffic Design and Visual Aids:

Intersection Design- channelization, Rotary intersection design, Grade separation, Traffic signs including VMS and road markings, Significant roles of traffic control personnel, Networking pedestrian facilities & cycle tracks.

LO: 1. Design various intersection points to control traffic.

Traffic Safety:

Accident Studies And Analysis; Causes Of Accidents - The Road, The Vehicle, The Road User and The Environment; Engineering, Enforcement and Education Measures For The Prevention of Accidents. Accident Data Recording – Condition Diagram, Collision Diagram.

LO: 1. Understand importance of accident studies
2. List out measures for prevention of accidents
3. Develop condition diagrams and collision diagrams

UNIT IV

Traffic Control, Regulation Signal Coordination:

Traffic Signals –Types Of Signals; Design Of Isolated Traffic Signal By Webster Method, Warrants For Signalization. Optimum Cycle Time- Saturation Flow Rate – Corrections for Left and Right Turns. Signal Coordination: Signal Co-Ordination Methods, Simultaneous, Alternate, Simple Progression and Flexible Progression Systems.

LO: 1. Gain knowledge on methodology to control traffic
2. Design signalling system.

TEXT BOOKS:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers.
2. Principles Of Highways Engineering and Traffic Analysis – Fred Mannering & Walter Kilareski, John Wiley & Sons Publication

REFERENCE BOOKS:

1. Transportation Engineering- An Introduction, C. Jotin Khisty, Prentice Hall Publication.
2. Fundamentals of Transportation Engineering - C. S. Papa Costas, Prentice Hall India.

E-RESOURCES:

- https://nptel.ac.in/courses/105/101/105101008/

PROFESSIONAL ELECTIVE-IV

E. SUSTAINABLE WATER RESOURCES DEVELOPMENT

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Demonstrate Role of water in National Development
2. Explain Water Resources Systems Analysis
3. Impart on Evaluation and monitoring of water quality and management of water distribution networks
4. Teach different methods for water balancing
5. Visualize Interstate Water Dispute Acts

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Demonstrate role of water in national development
CO2	Explain the planning requirements of irrigation project.
CO3	Design distribution networks for irrigation flood control and power generation
CO4	Explain the water management strategies
CO5	Explain the importance of interlinking of rivers
CO6	Explain interstate water disputes and arrive at feasible solutions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	2	-	-	-	-	-
CO2	3	-	-	-	-	2	2	-	-	-	-	-
CO3	3	2	3	-	-	2	2	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	2	-	-	-	-	-
CO6	3	-	-	-	-	-	2	-	-	-	-	-

UNIT I

Assessment of Water Resources of the country:

Water Resources Potential, Demand and Development -Role of water in National Development - Assessment of Water Resources of the country - River Basins - Hydro-meteorological and Hydrological Data. Assessment of Utilizable flows - Conventional and non-conventional methods - Estimation of Water need- National Water Policy. Conjunctive use of surface and ground water. Future Water Requirements - Scope of development.

LO: 1. Demonstrate role of water in national development

2. Assess water resources in country

3. Estimate future water need

UNIT II

Water Resources Planning and Project Formulation:

Water Resources Planning - Single and Multipurpose Projects - Project Formulation, Comparison of Alternatives - Cost Benefit Analysis. Cost Allocation among various purposes. Water Resources Systems Analysis - Optimization Approaches.

LO: 1. Understand the planning requirements of a irrigation project.

2. Compare alternative methods based on cost aspects

3. Optimization of approaches

Environmental Aspects of Integrated water Resources Development:

Evaluation and monitoring of water quality and management of water distribution networks for Irrigation, Flood control and Power generation - Catchment Treatment and Watershed Management. Command Area Development - Resettlement and Rehabilitation.

LO: 1. Evaluate and monitor water quality

2. Design distribution networks for irrigation flood control and power generation

UNIT III

Management Strategies for Excess and Deficit Water Balances

Flood Control & Management - Various methods of Control - Administrative Planning - Management Programmes and Flood Cushioning -Structural Methods. Non-structural Methods - Flood forecasting & Warning, Flood plain zoning and Flood proofing. Drought Prone Area Development - Soil Conservation Methods.

LO: 1. Understand the water management strategies

2. Explain flood forecasting and planning

3. Develop procedure to meet requirements in drought prone area

UNIT IV

Riparian Rights and Inter Basin Linking of Rivers:

Indian Scenario - Various Proposals and their Status - Dr. K. L. Rao's Proposal, Capt. Dastur's Garland Canal, National Perspective Plan, NWDA Link and Peninsular Rivers Development Component - Overall Benefits and Major constraints. Water Laws of India - Regulating Authorities - Interstate Water Dispute Acts - River Water Tributes - Cauvery, Krishna Godavari and Vamsadahra Tribunals.

LO: 1. Understand importance of interlinking of rivers

2. Explain water laws of India

3. Study interstate water disputes and arrive at feasible solutions

TEXT BOOKS:

1. A Textbook Of Irrigation Engineering and Hydraulic Structures, S K Sharma, S. Chand and Company Limited, New Delhi
2. Water Resource Engineering: R. L. Linsley & J. B. Fragini, MCgrohly

REFERENCE BOOKS:

1. Irrigation and Water Resources & Water Power, P. N. Modi ,Standard Book House.
2. Principles of Water Resource engineering: A.S. Gordman
3. Irrigation engineering and Hydraulic structures, S. K. Garg, Standard Book House.
4. Irrigation and water power engineering, Punmia & Lal, Laxmi Publications pvt. Ltd., New Delhi.

E-RESOURCES:

- https://ascelibrary.org/doi/book/10.1061/9780784414767

Structural Designing and Drawing using Software

Practical	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites: Reinforced concrete structures, Auto cad

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Evaluate cross sectional and reinforcement requirements of various structural elements by using STAAD.Pro

CO2 Evaluate quantities and prepare rate analysis for various works in construction of a building using Spread Sheets

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	3	-	3	3	-	-	3
CO2	3	3	3	-	-	3	-	3	3	-	-	3

List of Experiments

PART-A

Analysis of the following concrete & steel structural elements using STAAD. Pro Software.

1. **Design of continuous beam.**
2. **Design of plane frame**
3. **Design of space frame.**
4. **Design of G+4 Residential building: Creating model from the given drawing, Assigning Loads and Load Combinations**
5. **Design of G+4 Residential building: Creating model from the given drawing, Assigning Lateral Loads**
6. **Design of G+4 Residential building: Preparation of detail drawing, Preparation of Design Documents**
7. **Design of Roof Truss**

PART – B

1. **Estimate & Working out rates using spread sheets for the different items in a single Story building.**
2. **Demonstration of software's ETABS**

Environmental Engineering Lab

Practical	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites: Environmental Engineering

Course Objectives:

- Estimation some important characteristics of water and wastewater in the laboratory
- It also gives the significance of the characteristics of the water and wastewater

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Determine some important characteristics of water and wastewater in the laboratory

CO2 Outline some conclusion and decide whether the water is potable or not.

CO3 Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments

CO4 Determine strength of the sewage in terms of BOD and COD

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
CO3	3	3	-	-	-	3	-	2	3	-	-	3
CO4	3	3	-	-	-	3	-	2	3	-	-	3

List of Experiments

- Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
- Determination and estimation of Total Hardness–Calcium & Magnesium.
- Determination of Alkalinity/Acidity
- Determination of Chlorides in water and soil
- Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
- Determination of Iron.
- Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.
- Determination of N, P, K values in solid waste
- Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
- Determination of C.O.D.
- Determination of Optimum coagulant dose.
- Determination of Chlorine demand.
- Presumptive Coliform test.

TEXT BOOKS:

Standard Methods for Analysis of Water and Waste Water – APHA Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

REFERENCE BOOKS:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

PROJECT WORK-I

Practical	4 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites:

Course Objectives:

- To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Apply all levels of engineering knowledge in solving the Engineering problems
CO2 Work together with team spirit
CO3 Document the project

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	3	3	-	3	3	-	3	3
CO2	3	3	3	3	3	3	-	3	3	-	3	3
CO3	3	3	3	3	3	3	-	3	3	-	3	3

Evaluation of Project work-I

Project work-I shall be evaluated for a total of 100 marks.

- Of 100 marks, 40 marks shall be awarded by the project supervisor based on student's involvement in carrying out the project and the remaining 60 marks are based on presentation and viva-voce before a committee consisting of two supervisors and a senior faculty of the department.
- There will be no external assessment for Project work-I.

Summer Internship/ Design Project

Practical	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			

Evaluation of Summer Internship/ Design Project

Summer Internship/ Design Project shall be evaluated for a total of 100 marks. Of 100 marks, 40 marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 60 marks are for final Viva–Voce examination conducted by the committee consisting of two Internal Examiner and the Head of the Department at the end of IV B.Tech I semester.

ENTREPRENEURSHIP

Lecture – Tutorial:	2-0 Hours	**Internal Marks:**	40
Credits:	0	**External Marks:**	60

Prerequisites:

Course Objectives:

1. To understand entrepreneurial process and its significance in economic development of a nation.
2. To provide awareness about entrepreneurship.
3. To develop idea generation, creative and innovative skills.
4. To design business plan

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyse the business environment
CO2	Analyse and identify business opportunities.
CO3	Identify the elements of success of entrepreneurial ventures.
CO4	Statutory legal and financial regulations to start a business.
CO5	Evaluate effectiveness of different entrepreneurial strategies.
CO6	Specify performance indicators of entrepreneurship

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	-	-	-	-	-	-	2	-	2	-
CO2	1	2	-	-	-	-	-	-	2	-	2	-
CO3	1	-	-	-	-	-	-	-	2	-	2	-
CO4	1	-	-	-	-	-	-	-	2	-	2	-
CO5	1	2	-	-	-	-	-	-	2	-	2	-
CO6	1	-	-	-	-	-	-	-	2	-	2	-

UNIT I

Entrepreneurship

Entrepreneur – Characteristics and qualities, Entrepreneurs vs. Intrapreneurs and Managers – Classification of Entrepreneurs. Opportunities for Entrepreneurs in India and Abroad.

UNIT II

Micro, Small and Medium Enterprises

Small Enterprises – Definition, Classification – Characteristics, – Project Formulation – Steps involved in setting up of a Small Business – Identifying, Selecting a Business. Forms of Business; Women Entrepreneurship; Rural Entrepreneurship.

UNIT III

Idea Generation and Feasibility Analysis

Sources of Ideas - Methods of idea generation - - Product Identification - Opportunity Selection - What is a Business Plan - Significance - Formulation of Business Plan - Business Opportunities in Various Sectors

UNIT IV

Institutional support for Entrepreneurship

Role of Central and State Government in promoting Entrepreneurship – Introduction to various incentives, subsidies and grants.

Resources for Start-up

Need – Sources of Finance, Banking sources; Non-banking Institutions and Agencies; Venture Capital – Meaning and Role in Entrepreneurship; Government Schemes for funding business

TEXT BOOKS:

1. Entrepreneurial Development, S.S.Khanka, S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
2. Entrepreneurship – Theory, Process and Practice, Donald F Kuratko, 9th edition, Cengage Learning 2014.

REFERENCE BOOKS:

1. Entrepreneurship, Hisrich Robert D, Peters M P, 8th Edition, Tata McGrawHill, 2013.
2. Entrepreneurship, Rajeev Roy, 2nd edition, Oxford University Press, 2011.
3. The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya Publishing House, 2011

E-RESOURCES:

- https://lecturenotes.in/subject/35/entrepreneurship-development-ed

IV-II CE

SYLLABUS

NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING NRIA 18

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

IV YEAR IISEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
		Professional Elective -5/MOOCS 1/ Swayam								
	18A4201511	Civil Infrastructure forSmart City Development(Swayam)								
	18A4201512	Geo-techniques forDesign of UndergroundStructures	2	1	0	3	40	60	100	3
	18A4201513	Remote Sensing andGIS								
	18A4201514	Road safety Engineering								
	18A4201515	River Basin Management								
		Professional Elective -6/ MOOCS 2/ Swayam								
	18A4201521	Advanced StructuralDesign								
	18A4201522	Geosynthetics								
	18A4201523	EnvironmentalEconomics	2	1	0	3	40	60	100	3
	18A4201524	Urban TransportationPlanning								
	18A4201525	Water Shed Management								
	18A4201791	Project - II	0	0	16	16	40	160	200	14
		Total	**4**	**2**	**16**	22	**120**	**280**	**400**	**20**

Head of The Department
CIVIL ENGINEERING
NRI Institute of Technology
POTHAVARAPPADU.

PROFESSIONAL ELECTIVE-V

A. CIVIL INFRASTRUCTURE FOR SMART CITY DEVELOPMENT (SWAYAM)

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites:
Course Objectives:

1. To understand and explain Green building concepts, Smart urban transport systems, E-Governance and IOT.

Course Outcomes:
Upon successful completion of the course, the student will be able to:

CO1 Explore and understand the fundamental concepts of smart and sustainable cities.
CO2 Explain the component of smart cities and dwell into their technological advancement.
CO3 Explain the involvement of stake holders in the design and implementation of responsive smart cities.
CO4 Develop work break down structure, scheduling of smart cities
CO5 Explain the importance of different linkages and their roles including government, urban planners, universities, city developers and communities.
CO6 Identify and recognize the role of ICT and data analytics in addressing the urban challenges and key issues

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	-	-	-	-	-	-
CO2	3	-	-	-	-	2	-	-	-	-	-	-
CO3	3	-	2	-	-	2	-	-	-	-	-	-
CO4	3	-	2	-	-	2	-	-	-	-	-	-
CO5	3	-	-	-	-	2	-	-	-	-	-	-
CO6	3	-	2	-	-	2	-	-	-	-	-	-

-UNIT I

Smart city development

Understanding – Dimensions – Global experience, Global standards and performance bench marks, Practice codes. India 100 smart cities policy and mission, Smart city planning and development, Financing smart cities development, Governance of smart cities

Green building concepts and sustainable development

Green projects in smart cities, sustainability – green building – Rating system – Energy efficient building – energy saving systems.

UNIT II

Smart urban transport systems

Elements of Infrastructure (Physical, Social, Utilities and services), Basic definitions, concepts, significance and importance; Data required for provision and planning of urban networks and services; Resource analysis, Provision of infrastructure. Role of transport, types of transport systems, evolution of transport modes, transport problems and mobility issues. Urban form and Transport patterns, land use – transport

cycle, concept of accessibility. Hierarchy, capacity and geometric design elements of roads and intersections. Basic principles of Transport infrastructure design. Urban transport planning process –Transport, environment and safety issues. Principles and approaches of Traffic Management, Transport System Management.

UNIT III

Project management in Smart Cities

Phases, Stages of project and work break down Structure, Project organization structure, Planning, Scheduling and CPM, Project cost analysis, resource allocation & levelling, Line of balancing technique, Project monitoring and control, Project risk management

UNIT IV

E- governance and IOT

The concept of management, concept of e-management & e-business, e-Government Principles, Form e-Government to e-governance, e-governance and developing countries, Designing and Implementing e-Government Strategy, E governance: Issues in implementation. IOT fundamentals, protocols, design and development, data analytics and supporting services, case studies.

TEXT BOOKS:

1. 'Regional Development and Planning for the 21st Century: New Priorities and New Philosophies', Allen G.Noble, (Eds), Aldershot, USA, 1988.
2. Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, 2008

REFERENCE BOOKS:

1. 'Handbook of Local and Regional Development', Andy Pike, Andres Rodriguez-Pose, John Tomaney, Taylor & Francis, 2010
2. 'Fifty years of Dutch National Physical Planning, Andreas Faludi and Sheryl Goldberg, Alexandrine Press, Oxford, 1991.

E-RESOURCES:

- https://nptel.ac.in/courses/105/106/105106115/

PROFESSIONAL ELECTIVE-V

B. GEO-TECHNIQUES FOR DESIGN OF UNDERGROUND STRUCTURES

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Soil Mechanics, Foundation Engineering

Course Objectives:

1. To teach excavation methods and design of supporting systems
2. To train analysis of deep excavation techniques
3. Explain the design procedure of excavation supporting systems.
4. To demonstrate excavation and protection procedure to be adopted during constructions carrying out below the ground level.
5. To teach the elements and construction process of tunnel

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Compute the safe bearing capacity of footings subjected to vertical and inclined loads.

CO2 Explain the advanced methods of settlement computations and proportion foundation footings.

CO3 Identifying the methods of computing the pull-out capacity and negative skin friction of piles and compute the settlements of pile groups in clays.

CO4 Evaluate the problems posed by expansive soils and the different foundation practices devised.

CO5 Differentiate between isolated footings and combined footings and mat foundations.

CO6 Design of piles and pile caps in different soils

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	2	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	3	3	-	-	2	-	-	-	-	-	-

UNIT I

Excavation Methods and Lateral Supporting System

Introduction - excavation methods and lateral supporting systems – retaining walls – strutting systems – factors influencing on the selection of the retaining strut system – case history. Lateral earth pressure for design of supporting systems - Rankine's and Coulomb's earth pressure theory – earth pressure for design of excavation.

LO: 1. Understand excavation process

2. Identify appropriate lateral supporting systems.

UNIT II

Settlement analysis: Immediate settlement of footings resting on granular soils – Schmertmann & Hartman method – De Beer and Martens method - Immediate

settlement in clays – Janbu's method – correction for consolidation settlement using Skempton and Bjerrum's method – Correction for construction period.

LO: 1. Understand settlement analysis by various methods.

2. Study corrections for construction period

UNIT III

Analysis of Deep Excavation

Introduction - free and fixed earth support method – shear failure of strutted walls – push in – basal heave - upheaval – sand boiling - Stress and deformation analysis of excavation: simplified method – beam on elastic foundation method – finite element method.

LO: 1. Learn procedures in deep excavation.

2. Understand concept of beams on elastic foundations

Design of Excavation Supporting Systems

Introduction – design methods and factor of safety – retaining wall – structural components in braced excavations – strut systems – anchor systems – tests of anchors

UNIT IV

Pile foundations

Single pile versus group of piles – load-carrying capacity of pile groups – negative skin friction (NSF) -settlement of pile groups in sands and clays – laterally loaded piles in granular soils – Reese and Matlock method – laterally loaded piles in cohesive soils – Davisson and Gill method – Broms' analysis.

LO: 1. Explain conditions for adopting pile foundations

2. Design piles and pile caps in different soils.

TEXT BOOKS:

1. J. E. Bowles Foundation Analysis and Design, John Wiley
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS Publishers

REFERENCE BOOKS:

1. Foundation Design, W.C. Teng, Prentice Hall Publishers
2. Analysis and Design of Substructures, Saran S., Taylor & Francis Publishers, 2006
3. Design of Foundation Systems: Principles and Practices, Kurien, N.P., Narosa Publishing House, New Delhi, 1999
4. Pile Foundation Analysis and Design, Poulos, H. G., and Davis, E. H., John Wiley, 1980.

E-RESOURCES:

- https://nptel.ac.in/courses/105/108/105108075/
- https://nptel.ac.in/content/storage2/courses/105101083/download/lec1.pdf

PROFESSIONAL ELECTIVE-V

C. REMOTE SENSING AND GIS

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites:

Course Objectives:

1. Introduce the basic principles of Remote Sensing and GIS techniques.
2. Teach various types of satellite sensors and platforms
3. Impart concepts of visual and digital image analyses
4. Teach concepts of principles of spatial analysis
5. Teach application of RS and GIS to Civil engineering

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Comparing with ground, air and satellite based sensor platforms.
CO2	Interpret the aerial photographs and satellite imageries.
CO3	Create and input spatial data for GIS application.
CO4	Explain RS concepts in water resources engineering.
CO5	Explain GIS concepts in water resources engineering.
CO6	Applications of various satellite data.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	2	-	-	-	-	-	-	-
CO6	2	-	-	-	2	-	-	-	-	-	-	-

UNIT I

Introduction to photogrammetry:

Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

LO: 1. Understand concepts of photogrammetry
2. Estimate heights and distances.

UNIT II

Remote sensing:

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

LO: 1. Understand advantages of remote sensing
2. Demonstrate concepts of remote sensing.

UNIT III

Geographic information system:

Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS. Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

LO: 1. Understand concepts of GIS.

2. Explain data collection and data interpretation

3. Develop terrain characteristics using Mapping

UNIT IV

GIS spatial analysis:

Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

LO: 1 Applications of GIS and data interpretation.

Water resources applications:

Land use/Land cover in water resources, Surface water mapping and inventory - Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

LO: 1. Applications of RS & GIS in water resources applications.

2. Study technological problems like reservoir sedimentation ground water identification

TEXT BOOKS:

1. Remote Sensing and GIS by Oxford University Press, B. Bhatta, New Delhi.
2. Advanced surveying: Total station GIS and remote sensing, Satheesh Gopi, Pearson publication.

REFERENCE BOOKS:

1. Fundamentals of remote sensing, Universities press, George Joseph, Hyderabad.
2. Concepts & Techniques of GIS, C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
3. Remote sensing and GIS, B. S. Publications, M. Anji Reddy, New Delhi.
4. Remote Sensing and its applications, L. R. A. Narayana, University Press 1999.

E-RESOURCES:

- https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_CE_RS%20and%20GIS_Lecture%20notes.pdf
- https://nptel.ac.in/content/storage2/courses/105108077/module1/lecture1.pdf
- https://kanchiuniv.ac.in/coursematerials/Dr_K_Anitha_Course%20Material_Remote%20Sensing%20and%20GIS.pdf

PROFESSIONAL ELECTIVE-V

D. ROAD SAFETY ENGINEERING

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Highway Engineering, Traffic Engineering

Course Objectives:

1. Understand the road accidents and road safety improvement strategies
2. Analyze the crash data using statistical methods & conduct road safety audits
3. Understand the mechanism needed for crash reconstruction based on case studies
4. Apply accident mitigation measures in view of safety of user on a highway

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the road accidents and road safety improvement strategies
CO2	Analyze the crash data using statistical methods
CO3	Conduct road safety audits
CO4	Explain the mechanism needed for crash reconstruction based on case studies
CO5	Apply accident mitigation measures in view of safety of user on a highway
CO6	Explain the traffic management measures and its influence

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	3	-	-	-	-	-	-
CO2	3	2	-	3	-	3	-	-	-	-	-	-
CO3	3	-	-	-	-	3	-	-	-	-	-	-
CO4	3	-	-	-	-	3	-	-	-	-	-	-
CO5	3	-	-	-	-	3	-	-	-	-	-	-
CO6	3	-	-	-	-	3	-	-	-	-	-	-

UNIT I

TRAFFIC SAFETY

Road accidents, trends, causes, collision and condition diagrams, highway safety, human factors, vehicle factors.

SAFETY MANAGEMENT SYSTEMS AND STRATEGIES

Road safety management system, road safety improvement strategies, elements of a road safety plan, safety data needs.

UNIT II

STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA

Before-after methods in crash analysis, statistical methods for traffic safety analysis: Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons., Black Spot Identification & Investigations, Case Studies.

ROAD SAFETY AUDITS

Key elements of a road safety audit, Road Safety Audits and Investigations, Crash investigation and analysis, Describe methods for identifying hazardous road locations, Case Studies

UNIT III

CRASH RECONSTRUCTION

Describe the basic information that can be obtained from the roadway surface,

Understand basic physics related to crash reconstruction. CASE STUDIES FOR **CRASHES AND ACCIDENTS**

Speed for various skid, friction, and drag, and acceleration scenarios, crash vs accident, Case Studies

UNIT IV

ACCIDENT MITIGATION MEASURES

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Traffic calming.

TRAFIC MANAGEMENT EDUCATION AND ENFORCEMENT

Traffic management measures and their influence in accident prevention, legislation, enforcement, education and propaganda. Salient features of Motor vehicle act, 2019: registration and licensing authorities in India: Their powers and duties, legal requirements to be met for driving various classes of vehicles. Classification of traffic offences. Penalties and appeals

TEXT BOOKS:

1. Traffic Engineering and Transport Planning, Kadiyali,L.R. Khanna , NDLS, 2017.
2. Highway Engineering. Khanna, S.K. and Justo, C E G. , Nem Chand, RR, 2001

REFERENCE BOOKS:

1. Observational Before-After Studies in Road Safety, Hauer, E. , Pergamon, Turkey, 1997
2. Traffic Accident Investigation Manual, Stannard Baker. J, The traffic Institute North-western University, IL, US, 2019.
3. Traffic safety and human behaviour, Shinar, D.,Emerald, WY, UK, 2017

E-RESOURCES:

- https://nptel.ac.in/content/storage2/courses/105101008/downloads/cete_42.pdf
- https://nptel.ac.in/courses/105101008/downloads/cete_42.pdf
- https://roadsafety.piarc.org/en/road-safety-management

PROFESSIONAL ELECTIVE-V

E. RIVER BASIN MANAGEMENT

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Teach the basic concepts of river basin management
2. Demonstrate the various types flows and catchment process
3. Explain various monitoring systems and regulations in river basin management
4. Teach river basin management techniques

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Summarise the concepts of river basin management.
CO2	Implement the techniques in river basin management.
CO3	Compare methods and tools in river basin management
CO4	Check the river basin to obtain most possible benefits.
CO5	Planning of river basin.
CO6	Management of river basin.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	-	-	-	-	-	2	-	-	-	-	-
CO2	1	-	-	-	-	-	2	-	-	-	-	-
CO3	1	-	-	-	-	-	2	-	-	-	-	-
CO4	1	-	-	-	-	-	2	-	-	-	-	-
CO5	1	2	-	-	-	-	2	-	-	-	2	-
CO6	1	-	-	-	-	-	2	-	-	-	2	-

UNIT I

Basic Concepts of River Basin Management (RBM)

Integrated River Basin Management (IRBM) - River Basin Organizations (RBOs) - Types. Theories and Principles of IRBM - Need for RBM & Need for Irrigation- Objectives and Benefits of IRBM - Key Activities and Challenges in IRBM - Various Guiding Principles of IRBM - Scenarios in Developed and Developing Countries.

LO: 1. Learn basic concepts of river basin management.

2. Identify key activities and challenges of IRB

UNIT II

River Systems:

Recapitulation of Basic Principles of Hydrology - River Basins and Catchments - Hydrologic, Geomorphological, Physical & Chemical Processes. Stream Corridors, Stream Order Model- Functions of River Systems - Provisioning, Regulating, Cultural and Supporting Services - Low Base Flows - Ecological Stresses to Rivers - Human Interventions and Impacts - Man's Attitude towards Nature and Development. Engineered River Systems.

LO: 1. Understand river basin systems.

Explain functions of river system

Identify ecological stress on rivers and necessity of engineering river systems

UNIT III

Tools and Methods of IRBM:

Monitoring and Water Resources Information System - Monitoring, Acquisition and Processing of Water Resources Data - Statistical Tools - Decision Support Systems. Governance Issues - Water Governance - Its Importance - Fundamental Requirements for Good TBM - Rules, Regulations and Laws - Various Acts Enforced by Government of India for River Basin Management and Development.

LO: 1. Learn tools and methods of river basin management.

UNIT IV

River Basin Planning And Management (Strategies)

Water Resources Planning and Management of - Need, Various Aspects and Approaches of Planning and Management - Planning Process - Operational Management - Instruments of Operational Management - Water Quality Management - Water Charges and Cost Recovery - Issues related to Water Right and Water Allocation.

LO: 1. Understand river basin planning and strategic management.

TEXT BOOKS:

1. A Handbook for Integrated Water Resources Management in Basins Published by Global Water Partnership and International Network of Basin Organizations (INBO)
2. Modern Water Resources Engineering Edited, Lawrence K. Wang and Chih Ted Yang, Humana Press

REFERENCE BOOKS:

1. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg Khanna Publishers.
2. Applied hydrology, Chow V. T., D. R Maidment and L. W. Mays, Tata McGraw Hill Education Pvt. Ltd, (2011), New Delhi.
3. Water Resources Engineering Wiley India Pvt. Ltd, Mays L.W., (2013).
4. Integrated River Basin Management - www.universitywaterspectrumpartnership.org.

E-RESOURCES:

- https://nptel.ac.in/courses/105/106/105106145/

PROFESSIONAL ELECTIVE-VI

A. ADVANCED STRUCTURAL DESIGN

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Structural Analysis, Reinforced concrete structures

Course Objectives:

1. Familiarize Students with Raft Foundations and Retaining walls.
2. Equip student with concepts of design of different types of RCC water tanks.
3. Understand Concepts of flat slabs
4. Familiarize different types of Bunkers, Silos and Chimneys.
5. Understand different types of transmission towers.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design of raft foundations
CO2	Design different types of RCC retaining walls
CO3	Carryout analysis and design of different types of RCC water tanks
CO4	Analyze and design Flat slabs
CO5	Solve the problems design of RCC Bunkers, Silos
CO6	Explain various types of transmission towers and loading on them.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	-	-	3	-	3	-	-	-	-
CO2	3	3	3	-	-	3	-	3	-	-	-	-
CO3	3	3	3	-	-	3	-	3	-	-	-	-
CO4	3	3	3	-	-	3	-	3	-	-	-	-
CO5	3	3	3	-	-	3	-	3	-	-	-	-
CO6	3	3	3	-	-	2	-	3	-	-	-	-

UNIT I

Analysis and Design of Raft Foundations, Design of RCC Retaining walls: Cantilever and Counter fort

UNIT II

Analysis and Design of RCC Water Tanks, Circular and Rectangular types- Intze tank including staging.

UNIT III

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check for Punching shear.

UNIT IV

Analysis and Design of Bunkers and Silos- Concepts of Loading. Introduction to Transmission Towers- Principles and procedures

TEXT BOOKS:

1. Reinforced Concrete Structures' Vol-2 by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
2. 'Reinforced Concrete Structures' by N. Subrahmanian, Oxford Publishers

3. 'Design Drawing of Concrete and Steel Structures' by N. Krishna Raju University Press 2005.

REFERENCE BOOKS:

1. 'Essentials of Bridge Engineering' by D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. 'Reinforced concrete design' by S. U, Pillai and D. Menon, Tata Mc.Grawhill Publishing Company

E-RESOURCES:

- https://books.askvenkat.org/advanced-structural-design-asd-textbook-download/
- https://lecturenotes.in/subject/179/design-of-advanced-concrete-structures-dacs

INTERNAL EXAMINATION PATTERN:

The total internal marks (40) are distributed in three components as follows:

1. Descriptive (subjective type) examination: 35 marks

2. Assignment: 05 marks

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

PROFESSIONAL ELECTIVE-VI

B. GEOSYNTHETICS

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites:

Course Objectives:

1. To familiarize with geosynthetics.
2. To impart knowledge on designing the geosynthetics material for various functions.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain geosynthetics.
CO2	Interpret the test methods of different materials of geosynthetics.
CO3	Interpret the test methods of Geotextiles & Geo-grids
CO4	Interpret the test methods of Geo-membranes
CO5	Explain the manufacturing and materials required
CO6	Explain the applications of geosynthetics in construction

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	-	-	-	-	-	-
CO2	3	-	-	-	-	2	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-
CO4	3	-	-	-	-	2	2	-	-	-	-	-
CO5	3	-	-	-	-	2	-	-	-	-	-	-
CO6	3	-	-	-	-	2	-	-	-	-	-	-

UNIT I

Overview of Geosynthetics

Types – geotextiles, geo-grids, geo-nets, geo-membranes, geo-synthetic clay liners and geo-composites – their manufacturing

Geotextiles

Properties and test methods – functions – designing for separation, reinforcement, stabilization, filtration, drainage.

UNIT II

Geo-grids

Properties and test methods – design for geo-grid reinforcement for roads, reinforced wall, foundation, slopes and embankments.

Geo-membranes

Properties and test methods – design considerations of geo-membrane in pond, canal, reservoirs and solid liners

UNIT III

Manufacturing : Materials and Process

Raw materials : polyamide , polyester , polyethylene , polypropylene , poly vinyl chloride, Different type of geosynthetics based on manufacturing woven , monofilament , multifilament , slit filament , non-woven

Different bonding process : Mechanically bonded, Chemically bonded ,Thermally bonded

UNIT IV

Applications of Geosynthetics

Use of geosynthetics in roads , Use of reinforced soil in Retaining walls - Improvement of bearing capacity -Geosynthetics in environmental control and landfills - Ground Improvement by geodrains -Use of Geosynthetics in lining of canals

TEXT BOOKS:

1. Designing with Geosynthetics, Koerner, R.M, Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. An Introduction to Soil Reinforcement & Geosynthetics, G L Siva Kumar Babu, 1st edition, University press

REFERENCE BOOKS:

1. Soil Reinforcement with Geotextiles, Jewell, R.A., Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
2. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.

E-RESOURCES:

- https://nptel.ac.in/courses/105/101/105101143/

PROFESSIONAL ELECTIVE-VI

C. ENVIRONMENTAL ECONOMICS

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

This course aims to provide a comprehensive introduction to the economic analysis of issues arising from the interactions between the natural environment and the human economy. It underscores the role of entropy laws in this process of interaction. It focusses on the ecosystem-services and discusses comprehensively the challenges arising due to externalities, public-good character and non-tradability of such services. In particular, it highlights the resulting nature of market failure along with issues for social welfare and distributive implications in determining human well-being.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Examine the environmental issues in relation to the theory of externalities
CO2	Examine the environmental issues in relation to the public goods, and welfare
CO3	Illustrate and examine economic principles concerning the choice of instruments for controlling pollution and the relative strength and weaknesses of environmental policies
CO4	Examine various approaches developed for valuing environmental goods and services.
CO5	Examine various methods developed for valuing environmental goods and services.
CO6	Examine issues in the contemporary environmental discourse from an economists' point of view.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	-	-	-	2	-	-	-	-	-
CO2	2	2	-	-	-	-	2	-	-	-	-	-
CO3	2	-	-	-	-	-	2	-	-	-	-	-
CO4	2	-	-	-	-	-	2	-	-	-	-	-
CO5	2	-	-	-	-	-	2	-	-	-	-	-
CO6	2	-	-	-	-	-	2	-	-	-	-	-

UNIT I

Economy and the natural environment

The human economy – natural environment interaction. Biophysical Foundations of production and consumption of human economy Sources and Sink functions of the ecosystem. Material Balance approach: the concept and conditions of sustainability of the human economy.

Property Rights, Market, Spatial-temporal dimensions of externality.

UNIT II

Theory of Environmental Regulation and Policy

The socially optimal level of pollution and Pareto optimal allocation of resources. How to ensure the attainment of optimal pollution :

Assignment of Property Rights: Coase Theorem and its limitations

Government interventions - Command and Control: standard setting, Market based instruments: Pigouvian taxes - emission charges, ambient charges, product charges, subsidies, noncompliance fees, Tradable pollution permits.

Uncertainty and choice of regulatory instrument

UNIT III

Sustainable Economic Development

Capital theoretic basis of the notion of sustainable development: Sustainable Development as non-declining intertemporal utility or that of the value of the wealth. Concepts of Genuine investment or savings and Green National Income. Natural capital stock and sustainable resource accounting. Strong and weak Sustainability, Environmental Adjustment of National Income.

UNIT IV

Economic Development and Environment

The relation between Development Environmental Quality: Environmental Kuznets Curve Development vs conservation of environmental resources: Ecosystem flips and irreversibility: Krutilla-Fisher equation

Environmental Cost-Benefit Analysis under strong and weak conditions of sustainability: Choice of time discount rate for evaluation. Sustainability premium

TEXT BOOKS:

1. Intermediate Environmental Economics, Charles D Kolstad, 2012, Indian Edition, Oxford University Press, New Delhi
2. Environmental Economics and Management: Theory, Ecott J. Callan and Janet M. Thomas, 2013, Policy and Applications, Cengage Learning, Delhi.

REFERENCE BOOKS:

1. 'The Problem of Social Cost', R H Coase, 1960, The Journal of Law and Economics, III: 1-44
2. 'Economic Growth and the Environment', the Quarterly Journal of Economics, R H Coase, 1960, CX (2): 353-377.
3. 'Environmental Accounting: An Operational Perspective', Peter Bartelmus, Ernst Lutz and Jan Van Tongeren, 2001, in Ulanganathan Sankar (ed.) Environmental Economics, Oxford University Press, New Delhi.
4. Ecological Limits and Economic Development, Ramprasad Sengupta, 2013, Oxford University Press, New Delhi

E-RESOURCES:

- https://ocw.mit.edu/courses/economics/14-42-environmental-policy-and-economics-spring-2011/lecture-notes/
- http://econdse.org/wp-content/uploads/2016/08/chapter_3.pdf

PROFESSIONAL ELECTIVE-VI

D. URBAN TRANSPORTATION PLANNING

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Highway Engineering, Traffic Engineering

Course Objectives:

1. To learn various procedures for travel demand estimation.
2. To various data collection techniques for OD data.
3. To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Estimate travel demand for an urban area.
CO2	Plan the transportation network for a city.
CO3	Explain about collection of data and types of sources of data
CO4	Explain trip generation and distribution
CO5	Identify the corridor and plan for providing good transportation facilities.
CO6	Evaluate various alternative transportation proposals.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	2	3	-	-	-	-	-	-	-	-	-

UNIT I

Urban Transportation Problems & Travel Demand:

Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT II

Data Collection And Inventories:

Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT III

Trip Generation & Distribution:

UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household

Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT IV

Mode Choice Analysis:

Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

Traffic Assignment:

Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

TEXT BOOKS:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering – An Introduction' by Khisty C.J., Prentice Hall.
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill.

REFERENCE BOOKS:

1. Urban Transportation Planning: A decision oriented Approach' by Mayer M and Miller E, McGraw Hill.
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill.
4. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

E-RESOURCES:

- https://lecturenotes.in/subject/1222
- https://nptel.ac.in/courses/105/107/105107067/

PROFESSIONAL ELECTIVE-VI

E. WATER SHED MANAGEMENT

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Introduce the concept of watershed management
2. Understand the watershed characteristics
3. Learn the principles of soil erosion and measures to control erosion
4. Appreciate various water harvesting techniques.
5. Learn land management practices for various land use/land cover.
6. Introduce concepts of watershed modelling.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Determine watershed parameters and analyse watershed characteristics to take appropriate management action.
CO2	Quantify soil erosion and design control measures.
CO3	Apply land grading techniques for proper land management.
CO4	Suggest suitable harvesting techniques for better watershed management.
CO5	Explain appropriate models for watershed management.
CO6	Explain concepts of watershed modelling.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	2	-	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	2	-	-	-	-	-
CO6	3	-	-	-	-	-	2	-	-	-	-	-

UNIT I

Introduction

Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

Characteristics of Watersheds

Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT II

Principles of Erosion:

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT III

Water Harvesting:

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT IV

Land Management:

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

Watershed Modelling

Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

TEXT BOOKS:

1. 'Watershed Management' by Das MM and M.D Saikia, PHI Learning Pvt. Ltd, 2013.
2. 'Land and Water Management' by Murthy.VVN, Kalyani Publications, 2007.

REFERENCE BOOKS:

1. 'Water Resource Engineering by Wurbs R A and James R A, Prentice Hall Publishers, 2002.
2. 'Watershed Hydrology' by Black P E, Prentice Hall, 1996.
3. 'Watershed Management' by Murthy J V S, New Age International Publishers, 2006

E-RESOURCES:

- https://nptel.ac.in/courses/105/101/105101010/
- https://www.slideshare.net/GhassanHadi/watershed-1-42316353

PROJECT-II

Practical	16 Hours	**Internal Marks:**	40
Credits:	8	**External Marks:**	60

Prerequisites:

Course Objectives:

- To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
- To enable the student capable for problem solving / problem shooting.
- To install and inculcate team spirit/ team work in to the minds of the students.
- To enable/ train the students report making/ documentation.
- To provide students an opportunity to use any civil engineering software for their Project work.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Apply all levels of engineering knowledge in solving the Engineering problems
CO2	Use Civil Engineering software at least one.
CO3	Work together with team spirit
CO4	Document the project

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	3	3	-	-	3	-	3	3
CO2	3	3	3	3	3	3	-	-	3	-	3	3
CO3	3	3	3	3	3	3	-	-	3	-	3	3
CO4	3	3	3	3	3	3	-	-	3	-	3	3

Evaluation of Main Project

Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

Final Project Total marks – **200 Marks**
Internal Evaluation – **60 marks**
End Semester Examination (Viva – Voce) – **140 Marks**

Internal Evaluation:

The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

End Semester Examination (Viva – Voce):

140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year

PROFESSIONAL ELECTIVE-VI

D. URBAN TRANSPORTATION PLANNING

Lecture - Tutorial: 2-1 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Highway Engineering, Traffic Engineering

Course Objectives:

1. To learn various procedures for travel demand estimation.
2. To various data collection techniques for OD data.
3. To know various models and techniques for trip generation, trip distribution, mode choice and traffic assignment.
4. To develop alternative urban transport network plans.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Estimate travel demand for an urban area.
CO2	Plan the transportation network for a city.
CO3	Explain about collection of data and types of sources of data
CO4	Explain trip generation and distribution
CO5	Identify the corridor and plan for providing good transportation facilities.
CO6	Evaluate various alternative transportation proposals.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	3	-	-	2	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO6	3	2	3	-	-	-	-	-	-	-	-	-

UNIT I

Urban Transportation Problems & Travel Demand:

Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Trends, Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT II

Data Collection And Inventories:

Collection of data – Organisation of surveys and Analysis, Study Area, Zoning, Types and Sources of Data, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT III

Trip Generation & Distribution:

UTPS Approach, Trip Generation Analysis: Zonal Models, Category Analysis, Household

Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT IV

Mode Choice Analysis:

Mode Choice Behaviour, Competing Modes, Mode Split Curves, Aggregate and Disaggregate Approaches; Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property; Aggregation

Traffic Assignment:

Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment.

TEXT BOOKS:

1. 'Introduction to Urban System Planning' by Hutchinson, B.G., McGraw Hill.
2. 'Transportation Engineering – An Introduction' by Khisty C.J., Prentice Hall.
3. 'Fundamentals of Transportation Planning' by Papacostas, Tata McGraw Hill.

REFERENCE BOOKS:

1. Urban Transportation Planning: A decision oriented Approach' by Mayer M and Miller E, McGraw Hill.
2. 'Introduction to Transportation Planning' by Bruton M.J., Hutchinson of London.
3. 'Metropolitan Transportation Planning' by Dicky, J.W., Tata McGraw Hill.
4. 'Traffic Engineering and Transportation Planning' by Kadiyali.L.R., Khanna Publishers, New Delhi.

E-RESOURCES:

- https://lecturenotes.in/subject/1222
- https://nptel.ac.in/courses/105/107/105107067/

PROFESSIONAL ELECTIVE-VI

E. WATER SHED MANAGEMENT

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Introduce the concept of watershed management
2. Understand the watershed characteristics
3. Learn the principles of soil erosion and measures to control erosion
4. Appreciate various water harvesting techniques.
5. Learn land management practices for various land use/land cover.
6. Introduce concepts of watershed modelling.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Determine watershed parameters and analyse watershed characteristics to take appropriate management action.
CO2	Quantify soil erosion and design control measures.
CO3	Apply land grading techniques for proper land management.
CO4	Suggest suitable harvesting techniques for better watershed management.
CO5	Explain appropriate models for watershed management.
CO6	Explain concepts of watershed modelling.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	-	-	-	2	-	-	-	-	-
CO2	3	2	1	-	-	-	2	-	-	-	-	-
CO3	3	-	-	-	-	-	2	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	2	-	-	-	-	-
CO6	3	-	-	-	-	-	2	-	-	-	-	-

UNIT I

Introduction

Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

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PROJECT-II

Practical	16 Hours	**Internal Marks:**	40
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Prerequisites:

Course Objectives:

- To enable the student apply engineering knowledge that has been taught all through the programme for solving practical engineering problem.
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CO2	3	3	3	3	3	3	-	-	3	-	3	3
CO3	3	3	3	3	3	3	-	-	3	-	3	3
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Final Project Total marks – **200 Marks**
Internal Evaluation – **60 marks**
End Semester Examination (Viva – Voce) – **140 Marks**

Internal Evaluation:

The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project and evaluated by an internal committee.

End Semester Examination (Viva – Voce):

140 marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year

NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
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POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING NRIA20

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Fourier Transforms and Partial Differential Equations	2	1	0	3	30	70	100	3
2	20A2101401	Strength of Materials - I	2	1	0	3	30	70	100	3
3	20A2101402	Fluid Mechanics	2	1	0	3	30	70	100	3
4	20A2101403	Surveying and Geometrics	2	1	0	3	30	70	100	3
5	20A2101404	Highway Engineering	2	1	0	3	30	70	100	3
6	20A2101491	Concrete Technology Lab	0	0	3	3	15	35	50	1.5
7	20A2101492	Highway Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2101493	Surveying Field Work – I (Lab)	0	0	3	3	15	35	50	1.5
9	20A2101991	Land Surveying & Building Materials	1	0	2	3	--	50	50	1.5
10	20A2100801	Constitution of India	2	0	0	2	30	70	100	0
Total			**13**	**5**	**11**	**29**	**225**	**575**	**800**	**21**

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	2	1	0	3	30	70	100	3
2	20A2201401	Strength of Materials -II	2	1	0	3	30	70	100	3
3	20A2201301	Hydraulics and Hydraulic Machinery	2	1	0	3	30	70	100	3
4	20A2201402	Environmental Engineering	2	1	0	3	30	70	100	3
5	20A2201403	Engineering Geology (Integrated Theory & lab Course)	2	1	0	3	30	70	100	3
6	20A2200101	Managerial Economics &Financial Analysis	2	1	0	3	30	70	100	3
7	20A2201491	Environmental Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2201492	Strength of Material Lab	0	0	3	3	15	35	50	1.5
9	20A2201493	Fluid Mechanics &Hydraulics Machinery Lab	0	0	3	3	15	35	50	1.5
10	20A2201991	Field Studies & Audit Reports	1	0	2	3	--	50	50	1.5
Total			**13**	**6**	**11**	**30**	**225**	**575**	**800**	**24**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

Head of The Department
CIVIL ENGINEERING
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POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF CIVIL ENGINEERING

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Fourier Transforms and Partial Differential Equations	2	1	0	3	30	70	100	3
2	20A2101401	Strength of Materials - I	2	1	0	3	30	70	100	3
3	20A2101402	Fluid Mechanics	2	1	0	3	30	70	100	3
4	20A2101403	Surveying and Geometrics	2	1	0	3	30	70	100	3
5	20A2101404	Highway Engineering	2	1	0	3	30	70	100	3
6	20A2101491	Concrete Technology Lab	0	0	3	3	15	35	50	1.5
7	20A2101492	Highway Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2101493	Surveying Field Work – I (Lab)	0	0	3	3	15	35	50	1.5
9	20A2101991	Land Surveying & Building Materials	1	0	2	3	--	50	50	1.5
10	20A2100801	Constitution of India	2	0	0	2	30	70	100	0
		Total	**13**	**5**	**11**	**29**	**225**	**575**	**800**	**21**

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	**20A2200201**	**Probability and Statistics**	2	1	0	3	30	70	100	3
2	**20A2201401**	Strength of Materials -II	2	1	0	3	30	70	100	3
3	**20A2201301**	Hydraulics and Hydraulic Machinery	2	1	0	3	30	70	100	3
4	**20A2201402**	Environmental Engineering	2	1	0	3	30	70	100	3
5	**20A2201403**	Engineering Geology (Integrated Theory & lab Course)	2	1	0	3	30	70	100	3
6	**20A2200101**	Managerial Economics &Financial Analysis	2	1	0	3	30	70	100	3
7	**20A2201491**	Environmental Engineering Lab	0	0	3	3	15	35	50	1.5
8	**20A2201492**	Strength of Material Lab	0	0	3	3	15	35	50	1.5
9	**20A2201493**	Fluid Mechanics &Hydraulics Machinery Lab	0	0	3	3	15	35	50	1.5
10	**20A2201991**	Field Studies & Audit Reports	1	0	2	3	--	50	50	1.5
		Total	**13**	**6**	**11**	**30**	**225**	**575**	**800**	**24**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

20A2100201-VECTOR CALCULUS, FOURIER TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

Lecture-Tutorial	2-1	**Internal Marks:**	30
Credits	3	**External Marks:**	70

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them intoadvanced level by handling various real-world application

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Interpret the physical meaning of different operators such as gradient, cur landdivergence

CO2 Estimate the work done against a ield, circulation and lux using vector calculus

CO3 Apply the Laplace transform for solving differential equations

CO4 Find or compute the Fourier series of periodic signals

CO5 Knowandbe able to apply integral expressions for the forwards and inverse Fouriertransform to arrange of non-periodic wave forms

CO6 Identify solution methods for partial differential equations that model physical processes

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

UNIT I

Vector calculus:

Vector Differentiation: Gradient –Directional derivative–Divergence–Curl–Scalar Potential. Vector Integration: Line integral–Work done–Area–Surface and volume integrals.

Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)

UNIT II

Laplace Transforms:
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Inverse Laplace transforms– Convolution theorem (without proof).
Applications:
Solving ordinary differential equations (initial value problems) using Laplace transforms

UNIT III

Fourier series and Fourier Transforms:
Fourier Series:
Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms:
Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosinetransforms –inverse trans forms –Finite Fourier transforms

UNIT IV

PDE of irst order:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of irst order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT: V

Second order PDE:
Second order PDE: Solutions of linear partial differential equations with constant coef icient –RHSterm of the typee^{ax+by}, $\sin(ax + by)$, $\cos(ax + by)$, $x^m y^n$.
Method of separation of variables – introduction.

TEXT BOOKS:

1B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

REFERENCE BOOKS:

1. ErwinKreyszig, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.
3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.
4. Srimantha Pal, SCBhunia, Engineering Mathematics, Oxford University Press

E-RESOURCES:

1.**www.nptel**videos.com/mathematics/ (Math Lectures from MIT, Stanford,IIT'S)
2.nptel.ac.in/courses/122107
3.nptel.ac.in/courses/111105

20A2101401-STRENGTH OF MATERIALS - I

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.
2. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
3. The concepts above will be utilized in measuring de lections in beams under various loading and support conditions
4. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Understand the basic materials behaviour under the in luence of different external loading conditions and the support conditions

CO2 Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces

CO3 Knowledge of bending concepts and calculation of section modulus

CO4 Determine the stresses developed in the beams and de lections due to various loading conditions

CO5 Assess stresses across section of the thin cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation.

CO6 Assess stresses across section of the thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
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CO6	3	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Simple Stresses and Strains: Elasticity and plasticity – Types of stresses and strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateralstrain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – stresses in composite bars – Temperature stresses.

Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT II

Shear Force and Bending Moment: De inition of beam – Types of beams – Concept of shear force and bending moment – Point of contra lexure – Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

UNIT III

Flexural and shear Stresses in beams

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beam sections likerectangular, circular, I, T Angle sections.

UNIT IV

De lection of Beams: Bending into a circular arc – slope, de lection and radius of curvature – Differential equation for the elastic curve of a beam – Double integration and Macaulay's methods – Determination of slope and de lection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems – Moment area method – application to simple cases of cantilever.

UNIT V

Thin and Thick Cylinders:

Thin cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.

Thick cylinders: Introduction: Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses.

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S.Chand & Co, New Delhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. **Mechanics of Materials- by R. C.Hibbler, Pearson publishers**
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. **Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, UniversitiesPress**
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing HousePvt. Ltd.

E-RESOURCES:

- http://www.btechmaterials.com/download/strength-materials-ii-materials-notes/
- http://www.nptelvideos.in/2012/11/mechanics-of-solids.html
- http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html
- http://www.btechmaterials.com/download/strength-materials-materials-notes/

20A2101402-FLUID MECHANICS

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites:

Course Objectives:

1. To understand the properties of luids and luid statics
2. To derive the equation of conservation of mass and its application
3. To solve kinematic problems such as inding particle paths and streamlines
4. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
5. To analyze laminar and turbulent lows
6. To understand the various low measuring devices
7. To study in detail about boundary layers theory

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Explain the various properties of luids and their in luence on luid motion

CO2 Analyze a variety of problems in luid statics and dynamics.

CO3 Calculate the forces that act on submerged planes and curves.

CO4 Analyze various types of luid lows.

CO5 Apply the integral forms of the three fundamental laws of luid mechanics to turbulent and laminar low through pipes and ducts in order to predict relevant pressures, velocities and forces.

CO6 Measure the quantities of luid lowing in pipes, tanks and channels.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	2	-	1	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	3	-	-	-	2	-	-	-	-
CO5	2	2	-	3	-	-	-	2	-	-	-	-
CO6	2	2	-	2	-	-	-		-	-	-	-

UNIT I

Dimensions and units – Physical properties of luids - speci ic gravity, viscosity, surface tension, vapour pressure and their in luences on luid motion, pressure at a point, Pascal's law, Hydrostatic law -atmospheric, gauge and vacuum pressures- measurement of pressure. Pressure gauges, Manometers: Differential and Micro Manometers.

Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Centre of pressure.

UNIT II

Fluid Kinematics: Description of luid low, Stream line, path line and streak line and stream tube. Classi ication of lows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational lows – Equation of continuity for one, two , three dimensional lows – stream and velocity potential functions, low net analysis.

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line - Momentum equation and its application – forces on pipe bend

UNIT III

Laminar Flow and Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent lows, Shear and velocity distributions, Laws of Fluid friction,

Hagen-Poiseulle Formula, Flow between parallel plates, Flow through long tubes, hydro-dynamically smooth and rough lows.

Closed Conduit Flow: Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart, Pipe network problems, Hazen-Williams formula, Hard-Cross Method,

UNIT IV

Measurement of Flow: Pitot tube, Venturi meter and Ori ice meter – classi ication of ori ices, small ori ice and large ori ice, low over rectangular, triangular, trapezoidal and Stepped notches, Broad crested weirs and Ogee weirs

UNIT V

Boundary Layer Theory: Boundary layer (BL) – concepts, Prandtl contribution, Characteristics of boundary layer along a thin lat plate, Vonkarman momentum integral equation, laminar and turbulent Boundary layers (no deviations)- BL in transition, separation of BL, Control of BL, low around submerged objects-Drag and Lift- Magnus effect.

TEXT BOOKS:

1. "Fluid mechanics", Standard book house, New Delhi, Modi P.N and Seth S.M.(2018),
2. A text of Fluid mechanics and hydraulic machines, R.K.Bansal- Laxmi Publications (P) ltd., New Delhi

REFERENCE BOOKS:

1. Fluid mechanics and hydraulic machines Mc graw hill education, IInd edition, K.Subramanyam
2. Fluid Mechanics and Machinery, C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, OxfordHigher Education.
3. Principle of luid mechanics and luid machines III edition, university press

E-RESOURCES:

- http://www.btechmaterials.com/download/fluid-mechanics-fm-materials-notes/
- http://www.nptelvideos.in/2012/11/fluid-mechanics.html

20A2101403-SURVEYING AND GEOMETRICS

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Basic Civil Engineering Workshop

Course Objectives:

1. Know the principle and methods of surveying.
2. Measure horizontal and vertical- distances and angles
3. Recording of observation accurately
4. Perform calculations based on the observation
5. Identi ication of source of errors and recti ication methods
6. Apply surveying principles to determine areas and volumes and setting out curves
7. Use modern surveying equipment's for accurate results

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Apply the knowledge to calculate angles, distances and levels
CO2 Identify data collection methods and prepare ield notes
CO3 Explain the working principles of survey instruments, measurement errors and corrective measures
CO4 Interpret survey data and compute areas and volumes,
CO5 levels by different type of equipment
CO6 Relate the knowledge to the modern equipment and methodologies

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	1	-	-	-	-	-	-	-
CO2	2	3	-	-	1	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	3	-	-	1	-	-	-	-	-	-	-
CO5	2	3	-	-	1	-	3	1	-	-	-	-
CO6	2	-	-	-	-	-	2	1	-	-	-	-

UNIT I

Basic Concepts: Introduction, Objectives, classi ication and principles ofsurveying, surveying accessories. Introduction to Compass, levelling and Plane table surveying.

Measurement of Distances and Directions

Linear distances-Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections. **Prismatic Compass**- Bearings, included angles, Local Attraction, Magnetic Declination, and dip –W.C.B systems and Q.B. system of locating bearings.

UNIT II

Leveling- Types of levels, temporary and permanent adjustments, methods of levelling, booking and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section,volume of borrow pits, capacity of reservoirs.

UNIT III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometric levelling when base is accessible and inaccessible.

UNIT IV

Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry

Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omittedmeasurements.

UNIT V

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station-advantagesand Applications. Introduction to Global Positioning System.

TEXT BOOKS:

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi.
2. "Plane Surveying and higher surveying", Chandra A M, New Age International Pvt. Ltd.,Publishers, New Delhi.
3. "Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCE BOOKS:

1. Elements of Plane Surveying, Arthur R Benton and Philip J Taety McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. "Surveying Vol 1, 2 & 3), Arora K R, Standard Book House, Delhi.

E-RESOURCES:

- http://www.btechmaterials.com/download/surveying-materials-notes/
- http://www.nptelvideos.in/2012/11/modern-surveying-techniques.html
- http://www.nptelvideos.in/2012/11/surveying.html
- http://nptel.ac.in/courses/105104101/

20A2101404-HIGHWAY ENGINEERING

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Building Materials, Concrete Technology

Course Objectives:

- To impart different concepts in the ield of Highway Engineering.
- To acquire design principles of Highway Geometrics and Pavements
- To acquire design principles of Intersections

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Plan highway network for a given area.
CO2 Determine Highway alignment
CO3 Design highway geometrics.
CO4 Design Intersections and prepare traf ic management plans
CO5 Judge suitability of pavement materials
CO6 Design lexible and rigid pavements

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-		-		-	-	-	-
CO3	2	3	3	-	-	2	-	1	-	-	-	-
CO4	2	3	3	-	-	2	-	1	-	-	-	-
CO5	2	3	3	-	-	2	-	1	-	-	-	-
CO6	2	3	3	-	-	2	-	1	-	-	-	-

UNIT I

Highway Planning and Alignment: Highway development in India; Classi ication ofRoads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans– First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

UNIT III

Traf ic Engineering: Basic Parameters of Traf ic-Volume, Speed and Density-Traf ic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traf ic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traf ic Signals –Webster Method –IRC Method.

UNIT IV

Highway Materials: Subgrade soil: classi ication –Group Index – Subgrade soil strength-California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties –Tests for Road Aggregates – Bituminous Materials: Types –

Desirable properties – Tests on Bitumen-Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

UNIT V

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses –Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

TEXT BOOKS:

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traf ic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi
2. Principles of Transportation Engineering, Partha Chakroborthy and Animesh Das, PHI Learning Private Limited, Delhi

E-RESOURCES:

- https://www.alljntuworld.in/download/transportation-engineering-ii-materials-notes/
- http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html
- http://www.nptelvideos.in/2012/11/urban-transportation-planning.html
- http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html

20A2101491-CONCRETE TECHNOLOGY LAB

Labs / Instructions Hours/Week	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Concrete Technology

Course Objectives:

To study basic properties ingredients of concrete, fresh and hardened concrete properties

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Determine the properties of the constituent materials of concrete.

CO2 Test and evaluate properties of fresh concrete and the properties of hardened concrete including strength and durability.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	3	-	2	-	2	-	-	-	-
CO2	3	3	-	3	-	2	-	2	-	-	-	-

List of Experiments

1. Determination of normal Consistency and ineness of cement.
2. Determination of initial setting time and inal setting time of cement.
3. Determination of speci ic gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and ineness modulus of coarse aggregate by sieve analysis.
6. Determination of speci ic gravity of coarse aggregate
7. Determination of grading and ineness modulus of ine aggregate (sand) by sieve analysis.
8. Determination of bulking of sand.
9. Determination of workability of concrete by compaction factor method.
10. Determination of workability of concrete by slump test
11. Determination of workability of concrete by Vee-bee test.
12. Determination of compressive strength of cement concrete and its young's modulus
13. Determination of split tensile strength of concrete.
14. Non-Destructive testing on concrete (for demonstration)

Note: At least 10 experiments must be conducted (at least one for each property)

TEXT BOOKS:

1. Properties of Concrete by A. M. Neville, ELBS publications Oct 1996.
2. Concrete Technology by M.S. Shetty, S.Chand & Co 2009.

REFERENCE BOOKS:

1. Concrete: Micro Structure, Properties and Materials by P. K. Mehta and P. J. Monteiro,. Mc. Graw-Hill Publishing Company Ltd. New Delhi
2. Design of Concrete Mixes by N. Krishna Raju, CBS Publications, 2000.

E-RESOURCES

vlab.co.in

c. Spot speed studies.
d. Parking study.

DESIGN & DRAWING

a. Earthwork calculations for road works
b. Drawing of road cross sections
c. Rotary intersection design

TEXT BOOKS:

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan,Neam Chan Brothers New Chand Publications, New Delhi.
2. Highway Material Testing & Quality Control by Rao Wiley India pvt. Ltd., Noida, New Delhi

REFERENCE BOOKS:

1. IRC Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

E-RESOURCES

vlab.co.in

20A2101492-HIGHWAY ENGINEERING LAB

Labs / Instructions Hours/Week 3 Hours

Internal Marks: 15

Credits: 1.5

External Marks: 35

Prerequisites: Highway Engineering

Course Objectives:

- To test crushing value, impact resistance, speci ic gravity and water absorption, attrition value, abrasion value, lakiness index and elongation index for the given road aggregates.
- To know penetration value, ductility value, softening point, lash and ire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bituminous mix
- To carry out surveys for traf ic volume, speed and parking.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Test aggregates and judge the suitability of materials for the road construction

CO2 Test the given bitumen samples and judge their suitability for the road construction

CO3 Obtain the optimum bitumen content for Bituminous Concrete

CO4 Determine the traf ic volume, speed and parking characteristics.

CO5 Draw highway cross sections and intersections.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	3	-	2	-	2	-	-	-	-
CO2	3	3	-	3	-	2	-	2	-	-	-	-
CO3	3	3	-	3	-	2	-	2	-	-	-	-
CO4	3	3	-	3	-	2	-	2	-	-	-	-
CO5	3	3	-	3	-	2	-	2	-	-	-	-

List of Experiments

ROAD AGGREGATES:

a. Aggregate Crushing value Test
b. Aggregate Impact Test.
c. Speci ic Gravity and Water Absorption Test
d. Attrition Test
e. Abrasion Test.
f. Shape tests

BITUMINOUS MATERIALS:

a. Penetration Test.
b. Ductility Test.
c. Softening Point Test.
d. Flash and ire point tests.
e. Stripping Test
f. Viscosity Test.

BITUMINOUS MIX:

a. Marshall Stability test.

TRAFFIC SURVEYS:

a. Traf ic volume study at mid blocks.
b. Traf ic Volume Studies (Turning Movements) at intersection.

20A2101493- SURVEYING FIELD WORK-I (LAB)

Labs / Instructions Hours/Week 3 Hours **Internal Marks:** 15

Credits: 1.5 **External Marks:** 35

Prerequisites: Basic Civil Engineering Workshop, Surveying & Geometrics

Course Objectives:

- To impart the practical knowledge in the ield, it is essential to introduce in Curriculum. Drawing of Plans and Maps and determining the area are pre requisites before taking up any Civil Engineering works.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Conduct survey and collect ield data.

CO2 Prepare ield notes from survey data

CO3 Interpret survey data and compute areas and volumes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	2	3	-	2	1	-	-	-	-	-	-	2

List of Experiments

1. Survey by chain survey of road pro ile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse)
5. Plane table survey; inding the area of a given boundary by the method of Radiation
6. Plane table survey; inding the area of a given boundary by the method of intersection.
7. Two Point Problem by the plane table survey.
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling; Longitudinal Section and Cross sections of a given road pro ile.
12. Fly levelling and Fly chaining (complete ield work).

TEXT BOOKS:

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi.
2. "Plane Surveying and higher surveying", Chandra A M, New Age International Pvt. Ltd.,Publishers, New Delhi.
3. "Surveying (Vol – 1 & 2), Duggal S K, Tata McGraw Hill Publishing Co. Ltd. New Delhi.

REFERENCE BOOKS:

1. Elements of Plane Surveying, Arthur R Benton and Philip J Taety McGraw Hill.
2. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi
3. "Surveying Vol 1, 2 & 3), Arora K R, Standard Book House, Delhi.

E-RESOURCES

http://nptel.ac.in/video.php?subjectId=105104101

20A2101991- LAND SURVEYING & BUILDING MATERIALS

Practical	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Surveying, Building Materials

Course Content

Topographic Survey with contour map (Total station/ DGPS)

(OR)

Masonry 3' height with different bonds and different thickness

Evaluation of Skill Oriented Course

Skill Oriented Course shall be evaluated for a total of 50 marks. Of 50 marks, 15marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 35 marks are for inal Viva–Voce examination conducted by the committee consisting of an External Examiner and the Head of the Department.

20A2100801-CONSTITUTION OF INDIA

Lecture – Tutorial: 2-0 Hours **Internal Marks:** 30
Credits: 2 **External Marks:** 70
Prerequisites: Engineering Physics, Engineering Mechanics
Course Objectives:

5. To Enable the student to understand the importance of constitution
6. To understand the structure of executive, legislature and judiciary
7. To understand philosophy of fundamental rights and duties
8. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
9. To understand the central and state relation inancial and administrative.

Course Outcomes:
Upon successful completion of the course, the student will be able to:

CO1 Apply the knowledge on directive principle of state policy & analyze the History, features of Indian constitution
CO2 Explain the structure of Indian government & Differentiate between the state
CO3 Analyze the role Governor and Chief Minister & explain the role of state Secretariat
CO4 Compare and contrast district administration role and importance
CO5 Analyze the role of Myer and elected representatives of Municipalities
CO6 Know the role of Election Commission apply knowledge & Analyze role of state election commission

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	2	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	-	-	-	2	-	-	-	2
CO5	3	3	2	-	-	-	-	2	-	-	-	-
CO6	3	-	2	-	-	-	-	-	-	-	-	2

UNIT I

Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT III

State Government and its Administration Governor - Role and Position - CM and

Council of ministers, State Secretariat: Organisation, Structure and Function

UNIT IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected of icials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed of icials -Importance of grass root democracy

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt Ltd... New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust

REFERENCE BOOKS:

1. J. Raj Indian Government and Politics
2. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt Ltd.. New Delhi
3. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right)

E-RESOURCES:

- nptel.ac.in/courses/109104074/8
- nptel.ac.in/courses/109104045/
- nptel.ac.in/courses/101104065/
- www.hss.iitb.ac.in/en/lecture-details
- www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

II-II

SYLLABUS

20A2200201-PROBABILITY AND STATISTICS

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70
Prerequisites:--- NIL

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT I

Descriptive Statistics and Methods for Data Science : Data Science- Introduction to Statistics- Population Vs sample – Collection of Data – Primary and Secondary Data - Types of Varibales : Dependent and Independent , Catagorical and Continuous Variables – Data Visualization - Measures of Central Tendency - Measures of Variability (spread and variance) – Skewness and Kurtosis

UNIT II

Correlation and Curve Fitting : Correlation –Correlation Coef icient – Rank Correlation – Regression Coef icients and properties – Regression lines – Method of Least Squares – Straight line – parabola – Exponential –power curves

UNIT III

Probability and distributions: Probability and conditional probability-Baye's theorem- Random variables- Discrete and continuous Random variables –Distribution Function- Mathematical Expectation and Variance – Binomial ,Poisson and Uniform and Normal Distributions

UNIT IV

Introduction – Population and Samples – Sampling distribution of Means and Variance (de inition only) – Central limit theorem (without proof) – Representation of the normal theory distributions –- Point and Interval estimations – Maximum error of estimate. Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of signi icance

UNIT V

One tail and two-tail tests-Tests Concerning One Mean and Two Means (Large Samples) – Tests onProportions. Introduction to t, χ^2 and F – Tests.

TEXT BOOKS:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

E-RESOURCES:

Nptel

20A2201401-STRENGTH OF MATERIALS - II

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Strength of Materials –I

Course Objectives:

- To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
- To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
- To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.
- Introduce the concept of unsymmetrical bending in beams Location of neutral axis De lection of beams under unsymmetrical bending.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Understand the basic concepts of Principal stresses developed in amember when it is subjected to stresses along different axes and design the sections.
CO2 Explain concepts of failures in the material considering different theories
CO3 Assess stresses in different engineering applications like shafts, springs
CO4 Assess stresses in different engineering applications like columns and struts
CO5 Assess stresses due to combined effect of direct and bending stresses on different
CO6 Explain the concept of unsymmetrical bending in beams Location of neutral axis De lection of beams under unsymmetrical bending.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	3	1	-	-	-	-	-	-	-	-
CO2	2	2	-	1	-	-	-	-	-	-	-	-
CO3	2	3	-	1	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	1	-	-	-	-	-	-	-	-
CO6	2	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Principal Stresses and Strains And Theories of Failures: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Theories of Failures: Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT II

Torsion of Circular Shafts and Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power

transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.

Springs: Introduction – Types of springs – de lection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel.

UNIT III

Columns and Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns- assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Long columns subjected to eccentric loading – Secant formula – Empirical formulae – Straight line formula – Prof. Perry's formula.

UNIT IV

Direct and Bending Stresses: Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNIT V

Unsymmetrical Bending and Shear Centre

Un-symmetrical Bending: Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes– Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis De lection of beams under unsymmetrical bending.

Shear Centre: Introduction Shear center for symmetrical and unsymmetrical sections (channel, I, T and L sections).

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press,
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.

E-RESOURCES:

- http://www.btechmaterials.com/download/strength-materials-ii-materials-notes/
- http://www.nptelvideos.in/2012/11/mechanics-of-solids.html
- http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html
- http://www.btechmaterials.com/download/strength-materials-materials-notes/

20A2201301-HYDRAULICS AND HYDRAULIC MACHINERY

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Fluid Mechanics

Course Objectives:

- To study about uniform and non-uniform lows in open channel and also to learn about the characteristics of hydraulic jump
- To introduce dimensional analysis for luid low problems
- To understand the working principles of various types of hydraulic machines and Pumps

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Solve uniform and non-uniform open channel low problems.
CO2 Apply the principals of dimensional analysis and similitude in hydraulic model testing
CO3 Understand the working principles of various hydraulic machineries
CO4 Design different types of turbines
CO5 Design of centrifugal and multi stage pumps
CO6 Design of reciprocating pump

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	1	-	-	2	2	-	-	-	-
CO3	3	-	-	1	-	-	2	2	-	-	-	-
CO4	2	-	-	3	-	-	1	2	-	-	-	-
CO5	2	-	-	3	-	-	1	2	-	-	-	-
CO6	2	-	-	3	-	-	1	2	-	-	-	-

UNIT I

UNIFORM FLOW IN OPEN CHANNEL:

Types of channels –Types of lows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical low: Speci ic energy-critical depth – computation of critical depth

NON-UNIFORM FLOW IN OPEN CHANNELS: Steady Gradually Varied low-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface pro iles-direct step method- Rapidly varied low, hydraulic jump, energy dissipation.

UNIT II

HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

UNIT III

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving lat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and ef iciency-Angular momentum principle.

UNIT IV

HYDRAULIC TURBINES – I: Layout of a typical Hydropower installation – Heads and ef iciencies - classi ication of turbines. Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and ef iciency, hydraulic design, draft tube – theory and ef iciency. Governing of turbines-surge tanks-unit and speci ic quantities, selection of turbines, performance characteristics-geometric similarity-cavitation

UNIT V

PUMPS:

CENTRAIFUGAL-PUMPS: Pump installation details-classi ication-work done-Manometric head-minimum starting speed-losses and ef iciencies-speci ic speed, multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves- NPSH- Cavitation.

RECIPROCATING PUMPS: Introduction, classi ication, components, working, discharge, indicator diagram, work done and slip.

TEXT BOOKS:

1. Open Channel low, K. Subramanya, Tata McGraw Hill Publishers
2. Fluid mechanics and hydraulic machines, Rajput, A.K(2018) , S chand ,New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

REFERENCE BOOKS:

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P. OJHA, R. BERNDTSSON and P.N. Chandramouli, Oxford Higher Education.
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higherducation.
4. Fluid mechanics and Hydraulic machines, R.K. Bansal, Laxmi publications ,New Delhi.

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/hydraulics.html
- http://www.nptelvideos.in/2012/11/advanced-hydraulics.html
- http://www.btechmaterials.com/download/hydraulics-hydraulic-machinery-hhm-material-notes/

20A2201402-ENVIRONMENTAL ENGINEERING

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70
Prerequisites:

Course Objectives:

- Outline planning and the design of water supply systems for a community/town/city and selection of source based on quality and quantity
- Design of water treatment plant for a village/city
- Impart knowledge on design of water distribution network
- Design of sewers and plumbing system for buildings
- Design of Sewage Treatment Plant

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Select a source based on quality and quantity

CO2 Estimate design population and water demand

CO3 Design a water treatment plant for a village/city

CO4 Design the water distribution network

CO5 Design a sewer by estimating DWF and Strom water low and plumbing system for buildings

CO6 Design a Sewage Treatment Plant for a town/city.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	1	-	-	-	-
CO3	2	-	-	-	-	-	-	1	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	-	-	-
CO5	2	2	3	-	-	-	-	1	-	-	-	-
CO6	2	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer.

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors in luencing it - factors affecting water demand, Design Period, Population forecasting.

Sources of Water: Lakes, Rivers, Comparison of sources with reference to quality, quantity and other considerations- Ground water sources: springs, Wells and In iltration galleries, Characteristics of water– Physical, Chemical and Biological characteristics and WHO guidelines for drinking water - IS 10500 2012 - Water quality standards for Agriculture, Industries and Construction.

UNIT II

Treatment of Water: Treatment methods: Theory and Design of Sedimentation, Coagulation, Filtration. **Disinfection**: Theory of disinfection-Chlorination and other Disinfection methods.

Removal of color and odors- Removal of Iron and Manganese - Adsorption-Fluoridation and de louridation–Reverse Osmosis- Solar stills- Freezing

UNIT III

Collection and Conveyance of Water: Factors governing the selection of the intake structure, Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, Design of economical diameter of pumping main, HP of pump and monthly expenditure for an apartment and a village. Laying and testing of pipe lines- Capacity of storage reservoirs, Mass curve analysis.

Distribution of Water: Methods of Distribution system, Layouts of Distribution networks, Water main appurtenances - Sluice valves, Pressure relief valves, air valves, check valves, hydrants, and water meters–Ideal water supply system. Case studies.

UNIT IV

Sewerage: Estimation of sewage low and storm water drainage – luctuations – types of sewers -design of sewers.

Sewer appurtenances – cleaning and ventilation of sewers. **Sewage pumps.**

House Plumbing: Systems of plumbing-sanitary ittings and other accessories–one pipe and two pipe systems – Design of drainage in Gated communities, Apartments and Hotels.

Septic Tank - working Principles and Design

UNIT V

Sewage characteristics –Characteristics of sewage - BOD equations. ThOD, COD and BOD.

Treatment of Sewage: Primary treatment. **Secondary treatment:** Activated Sludge Process, principles, designs, and operational problems. Oxidation ponds, Trickling Filters – classi ication – design, operation and maintenance problems. RBCs. Fluidized bed reactors –Anaerobic digestion of sludge, Sludge Drying Beds.

Ultimate Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve- Disposal into sea, disposal on land, Crown corrosion, Sewage sickness. Ef luent standards.

TEXT BOOKS:

1. Rural Municipal and Industrial water management, KVSG Murali Karishna, Environmental Protection Society, Kakinada, 2021.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna, Paramount Publications, Visakhapatnam, 2018.
3. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

REFERENCE BOOKS:

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.
5. Environmental Engineering, Ruth F. Weiner and Robin Matthews – 4th EditionElsevier,2003
6. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.

E-RESOURCES:

- https://www.alljntuworld.in/download/environmental-engineering-ee-materials-notes/

20A2201403-ENGINEERING GELOGOY Integrated (Theory & Lab)

Lecture – Practical: 2-2 Hours **Internal Marks:** 30
Credits: 3 **External Marks:** 70

Prerequisites: Engineering Physics, Engineering Mechanics

Course Objectives:

1. To introduce the course: Engineering Geology to the Civil Engineering graduates.
2. To enable the students, understand what minerals and rocks are and their formation and identi ication.
3. To highlight signi icance/ importance/ role of Engineering Geology in construction of Civil Engineering structures.
4. To enable the student, realise its importance and applications of Engineering Geology in Civil Engineering constructions.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Identify and classify the geological minerals

CO2 Measure the rock strengths of various rocks

CO3 Classify and measure the earthquake prone areas to practice the hazard zonation

CO4 Classify, monitor and measure the Landslides and subsidence

CO5 Prepares, analyses and interpret the Engineering Geologic maps

CO6 Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	1	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	1	-	-	-	-	-	-	-	-
CO6	3	3	-	1	-	-	-	-	-	-	-	-

UNIT I

Basics of Geology: Branches of Geology, Importance of Geology in Civil Engineering with case studies.

Weathering: Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT II

Mineralogy and Petrology: De initions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classi ication, structures, textures and forms of Igneous rocks, Sedimentary rocks, metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt

etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate

UNIT III

Structural Geology: Strike, Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques. Earthquakes and Land Slides: Terminology, Classi ication, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classi ication of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides. **Geophysics:** Importance of Geophysical methods, Classi ication, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunneling, effects, Lining of Tunnels. In luence of Geology for successful Tunneling.

TEXT BOOKS:

1. 'Engineering Geology' by D. Venkat Reddy, Vikas Publishing House pvt. Ltd, 2013.
2. 'Engineering Geology' by N. Chennkesavulu, Trinity Press (Laxmi Publications), 2nd Edition, 2014.
3. 'Engineering Geology' by Vasudev Kanithi, University Press.

REFERENCE BOOKS:

1. 'Engineering Geology for Civil Engineers' by P.C. Varghese, PHI learning pvt. Ltd.
2. 'Geology for Engineers and Environmental Society' by Alan E Kehew, person publications, 3rd edition
3. 'Fundamentals of Engineering Geology' by P.G.Bell, B.S.P. Publications, 2012.
4. 'Engineering Geology' by V.Parthesarathi et al., Wiley Publications
5. 'Environmental Geology' by K.S.Valdiya, McGraw Hill Publications, 2nded.

E-RESOURCES:

- https://www.alljntuworld.in/download/engineering-geology-eg-materials-notes/
- http://www.nptelvideos.in/2012/11/engineering-geology.html

Practical	2 Hours	**Internal Marks:**	30
Credits:		**External Marks:**	70

Prerequisites:

Course Objectives:

- To identify the megascopic types of Ore minerals & Rock forming minerals.
- To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
- To identify the topography of the site & material selection.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Identify Megascopic minerals & their properties.

CO2 Identify Megascopic rocks & their properties.

CO3 Identify the site parameters such as contour, slope & aspect for topography.

CO4 Know the occurrence of materials using the strike & dip problems

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	-	1	1	-	-	-	-	-	-	2
CO2	2	1	-	1	1	-	-	-	-	-	-	-
CO3	2	3	-	2	1	-	-	-	-	-	-	2

List of Experiments

1. Physical properties of minerals: Mega-scopic identi ication of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc...
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc...
2. Megascopic description and identi ication of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite,
   Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble,
   Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults,
   Unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology & Structural Geology

20A2201491-ENVIRONMENTAL ENGINEERING LAB

Labs / Instructions Hours/Week 3 Hours | **Internal Marks:** 30

Credits: 1.5 | **External Marks:** 70

Prerequisites: Environmental Engineering

Course Objectives:

- Estimation some important characteristics of water and wastewater in the laboratory
- It also gives the signi icance of the characteristics of the water and wastewater

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Determine some important characteristics of water and wastewater in the laboratory

CO2 Outline some conclusion and decide whether the water is potable or not.

CO3 Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments

CO4 Determine strength of the sewage in terms of BOD and COD

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3
CO3	3	3	-	-	-	3	-	2	3	-	-	3
CO4	3	3	-	-	-	3	-	2	3	-	-	3

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of total solids, organic solids and inorganic solids and settleable solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter & Wrinklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.

TEXT BOOKS:

1. Standard Methods for Analysis of Water and Waste Water – APHA Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

REFERENCE BOOKS:

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty.

E-RESOURCES:

vlab.co.in

20A2201492-STRENGTH OF MATERIALS LAB

Labs / Instructions Hours/Week 3 Hours | **Internal Marks:** 30

Credits: 1.5 | **External Marks:** 70

Prerequisites: Strength of materials

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Conduct tension test on steel

CO2 Conduct compression tests on spring, wood, brick and concrete

CO3 Conduct lexural and torsion test to determine elastic constants

CO4 Determine hardness of metals

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2	-	-	-	-	2	-	-	-	2
CO2	3	1	2	-	-	-	-	2	-	-	-	2
CO3	3	1	2	-	-	-	-	2	-	-	-	-
CO4	3	1	2	-	-	-	-	2	-	-	-	2

List of Experiments

1. Tension test on Mild steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test (Charpy and Izod impact test)
9. Shear test (on UTM)
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – de lection test.

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S.Chand & Co, New Delhi
2. Strength of materials by R. K. Bansal, Lakshmi Publications.

REFERENCE BOOKS:

1. Mechanics of Materials- by R. C.Hibbler, Pearson publishers
2. Mechanics of Solids – E P Popov, Prentice Hall.
3. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, 3rd Edition, UniversitiesPress
4. Mechanics of Structures Vol – I by H.J.Shah and S.B.Junnarkar, Charotar Publishing HousePvt. Ltd.

E-RESOURCES:

vlab.co.in

20A2201493-FLUID MECHANICS & HYDRAULIC MACHINES LAB

Labs / Instructions Hours/Week 3 Hours **Internal Marks:** 30

Credits: 1.5 **External Marks:** 70

Prerequisites: Environmental Engineering

Course Objectives:

- To impart the experimental skills in low measurement and real luid low problems
- To impart experimental skills to verify the performance characteristics of pumps and turbines

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Utilize the knowledge in the design of water supply pipe networks and measure the rate of low in pipes and channels.
2. Design to turbines and able to identify suitable pumps and turbines for different working conditions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	-	-	3	-	2	3	-	-	3
CO2	3	3	-	-	-	3	-	2	3	-	-	3

List of Experiments

1. Calibration of Venturi meter & Ori ice meter
2. Determination of Coef icient of discharge for a small ori ice and mouth piece by a constant head and variable head method.
3. Calibration of contracted Rectangular Notch and /or Triangular Notch
4. Determination of Coef icient of loss of head in a sudden contraction and friction factor.
5. Verification of Bernoulli's equation.
6. Impact of jet on vanes
7. Study of Hydraulic jump.
8. Performance test on Pelton wheel turbine
9. Performance test on Francis turbine.
10. Ef iciency test on centrifugal pump.
11. Ef iciency test on reciprocating pump.

TEXT BOOKS:

1. Open Channel low, K. Subramanya, Tata McGraw Hill Publishers
2. Fluid mechanics and hydraulic machines, Rajput, A.K{2018}, S chand ,New Delhi
3. Fluid Mechanics, Modi and Seth, Standard book house.

REFERENCE BOOKS:

1. Fluid Flow in Pipes and Channels, G.L. Asawa, CBS
2. Fluid Mechanics and Machinery, C.S.P. OJHA, R. BERNDTSSON and P.N. Chandramouli, Oxford Higher Education.
3. Fluid Mechanics and Machinery, Md. Kaleem Khan, Oxford Higherducation.
4. Fluid mechanics and Hydraulic machines, R.K. Bansal, Laxmi publications ,New Delhi.

E-RESOURCES:

vlab.co.in

20A2201991-FIELD STUDIES & AUDIT REPORTS

Labs / Instructions Hours/Week	3 Hours		15
Credits:	1.5	**External Marks:**	35
Prerequisites:			

Course Content

Environmental Audit and compliance report

OR

Road safety audit with 1 or 2 KM length

OR

Water related leakage ield studies

Evaluation of Skill Oriented Course

Skill Oriented Course shall be evaluated for a total of 50 marks. Of 50 marks, 15marks shall be awarded by an internal committee consisting of two faculty members based on the presentation given and work carried out by a student and the remaining 35 marks are for inal Viva–Voce examination conducted by the committee consisting of an External Examiner and the Head of the Department.

20A2201991-FIELD STUDIES & AUDIT REPORTS

Labs / Instructions Hours/Week	3 Hours		15
Credits:	1.5	**External Marks:**	35
Prerequisites:			

Course Content

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NRI INSTITUTE OF TECHNOLOGY

POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE FOR FOURTH YEAR B.TECH PROGRAMME

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A4102401	Switch Gear and Protection	3	-	-	3	40	60	100	3
2	18A4102402	Power System Operation and Control	3	-	-	3	40	60	100	3
3	18A4102403	Digital Control Systems	3	-	-	3	40	60	100	3
4	18A4102511 18A4102512	**Professional Elective:** 1) Electrical Distribution Systems 2) Power Quality	3	-	-	3	40	60	100	3
5	18A4102521 18A4102522	**Professional Elective:** 1) HVDC Transmission 2) High Voltage Engineering	3	-	-	3	40	60	100	3
6	18A4104609 18A4104610 18A4104611	**OE-IV:** 1) Linear Integrated Circuit and Applications 2) Digital Image Processing 3) Wireless Communications	3	-	-	3	40	60	100	3
7	18A4102491	Power Systems Lab	-	-	3	3	40	60	100	1.5
8	18A4102492	Electrical Engineering Workshop Lab	-	-	3	3	40	60	100	1.5
9	18A4100802	IPR & Patents	2	-	2	2	40	60	100	-
10	18A4102791	Term Paper	-	-	-	-	40	60	100	1
11	18A4102792	Technical Seminar	-	-	-	-	40	60	100	2
Total			**20**	**-**	**8**	**26**	**440**	**660**	**1100**	**24**

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A4202511	**Professional Elective:** 1) FACTS 2) Energy Audit, Conservation & Management	3	-	-	3	40	60	100	3
2	18A4202522	**Professional Elective:** 1) Power System Reforms 2) Special Electrical Machines	3	-	-	3	40	60	100	3
3	18A4202791	Project	-	-	3	3	140	60	200	8
Total			**6**	**-**	**3**	**9**	**200**	**180**	**400**	**14**

L - LECTURE T – TUTORIAL P - PRACTICAL CIA – Continuous Internal Assessment
SEA – Semester End Assessment

Dr. N. SAMBASIVA RAO
B.Tech, M.Tech, Ph.D, MISTE
Head of the Department & Professor of EEE
NRI INSTITUTE OF TECHNOLOGY (KN)

SWITCH GEAR AND PROTECTION

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Concepts of Power Systems-I, Power Systems II and Microprocessors.

Course Objectives:

The Objectives of learning this Course are:

- To study the classification, operation and application of different types of electromagnetic protective relays.
- To explain the principle and operation of different types of static relays.
- To explain protective schemes, for generator and transformers.
- To impart knowledge of various protective schemes used for feeders and bus bars.
- To provide the basic principles and operation of various types of circuit breakers.
- To study different types of over voltages in a power system and principles of different protective schemes for insulation co–ordination.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the working principle and constructional features of different types of electromagnetic protective relays
CO2	Compare different types of static relays with a view to application in the system.
CO3	Relate the acquired in depth knowledge of faults that is observed in high power generator and transformers and protective schemes used for all protections
CO4	Improve the ability to understand various types of protective schemes used for feeders and bus bar protection
CO5	Illustrate the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6gas type
CO6	Explain different types of over voltages appearing in the system, including existing protective schemes

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	-	-	3	-	3	-	-	-	-	-	-	-
CO2	-	3	-	-	3	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-
CO4	-	2	2	-	2	-	-	-	-	-	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	2	-	-	2	-	-	-	-

UNIT I – PROTECTIVE RELAYING

ELECTROMAGNETIC RELAYS:

Protective Relaying Mechanism - Classification of Relays– Attraction Relays: Attracted Armature and Solenoid & Plunger Type - Balanced beam type attracted armature relay – Induction relays: Induction Disc, Watthour Meter and Induction Cup type – Torque equation

Applications of relays: Non- Directional Over Current Relays - Directional Over Current and Power Relays– Directional relays– Current, Percentage & Voltage Balance Differential Relays– Universal torque equation– Distance relays: Impedance, Reactance & Mho relays.

STATIC RELAYS:

Comparison of Static & Electromagnetic Relays – Basic Elements of Static Relay – Directional Static Overcurrent Relay – Static Differential Relay – Static Distance Relay – Microprocessor based Overcurrent Relay

UNIT II – ELECTRICAL APPARATUS PROTECTION

GENERATOR & TRANSFORMER PROTECTION:

Generators: Stator faults, Rotor faults and abnormal conditions – Differential & Merz Price Protection - Restricted, unrestricted earth fault, balanced earth fault, 100% earth fault and inter turn fault protection – Numerical examples on percentage winding protected.

Transformers: Transformer Faults - Percentage differential protection– Design of CT's ratio – Frame Leakage Protection - Buchholz relay protection–Numerical examples on CT ratios.

FEEDER & BUSBAR PROTECTION:

Protection of lines: Over current Protection schemes - Numerical examples - Carrier current and three zone distance relay using impedance relays.

Protection of bus bars: Circulating Current & Frame Leakage Protection.

UNIT III – ARC QUENCHING IN CIRCUIT BREAKERS

ARC PHENOMENON:

Arc Quenching: Formation, Maintenance & Extinction – AC & DC Circuit Breaking - Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching

CIRCUIT BREAKERS:

Description and operation of Air Blast– Air Break, Vacuum, SF6 and Double break Oil circuit breakers– Miniature Circuit Breaker(MCB)

UNIT IV –OVER VOLTAGE PROTECTION & NEUTRAL GROUNDING

OVER VOLTAGE PROTECTION:

Causes of over voltages: Lightning, Switching, Insulation Failure & Arcing Grounds - Protection against Direct & Indirect lightning Strokes: Ground Wires, Protector Tubes and Horn gap - Rod Gap - Multi gap - Expulsion type - Valve type - Metal oxide lightning arresters – Surge Absorbers – Insulation coordination– BIL– impulse ratio–Standard impulse test wave– volt-time characteristics

NEUTRAL GROUNDING:

Grounded and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding: Solid Earthing, Resistance Earthing, Resonant Earthing, Voltage Transformer Earthing and Earthing Transformer.

TEXT BOOKS:

1. A course in Electrical Power systems, J.B. Gupta, Kataria Publications.
2. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma, TMH Publications
3. Power system protection- Static Relays with microprocessor applications by T.S.MadhavaRao, TMH.

REFERENCE BOOKS:

1. Fundamentals of Power System Protection by Paithankar and S.R.Bhide, PHI, 2003.
2. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
3. Protection and Switch Gear by Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chothani, Oxford University Press, 2013

E-RESOURCES:

1. https://nptel.ac.in/courses/108/101/108101039/
2. https://nptel.ac.in/courses/108/105/108105104/
3. https://www.coursera.org/lecture/electric-power-systems/system-design-switching-circuit-breakers-0MMaF

POWER SYSTEM OPERATION AND CONTROL

Lecture – Tutorial:	4 – 1	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To understand optimal dispatch of generation with and without losses.
- To study the optimal scheduling of hydro thermal systems.
- To study the optimal unit commitment problem.
- To study the load frequency control for single area system with and without
- controllers
- .To study the load frequency control for two area system with and without controllers
- To understand the reactive power control and compensation of transmission lines.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Able to compute optimal scheduling of Generators.
CO2	Able to understand hydrothermal scheduling.
CO3	Understand the unit commitment problem.
CO4	Able to understand importance of the frequency.
CO5	Understand importance of PID controllers in single area and two area systems.
CO6	Will understand reactive power control and compensation for transmission line.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2	2					3	2			
CO2	3	2	3					2	2			
CO3	3	2	2					2	2			
CO4	3	2	2					3	2			
CO5	3	2	3									
CO6	3	2	2									

UNIT I

Economic Operation of Power Systems

Optimal operation of generators in thermal power stations, heat rate curve, cost curve, incremental fuel and production costs, input-output characteristics of steam unit, optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses, loss coefficients, general transmission line loss formula.

UNIT II

Hydrothermal Scheduling

Optimal scheduling of hydrothermal system, hydroelectric power plant models,

types of scheduling problems, short term hydrothermal scheduling problem.

UNIT III

Load Frequency Control

Modeling of speed governing system, steam turbine, hydro turbine and generator. Necessity of keeping frequency constant, definitions of control area, single area control, block diagram representation of an isolated power system, steady state analysis, dynamic response, proportional plus integral control of single area and its block diagram representation, steady state response. Load frequency control of 2- area system, tie-line bias control, comparison between load frequency control and economic dispatch control.

UNIT IV

Reactive Power Control

Overview of reactive power control, reactive power compensation in transmission systems, advantages and disadvantages of different types of compensating equipment for transmission systems, load compensation, specifications of load compensator, uncompensated and compensated transmission lines, shunt and series compensation.

Text books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

References:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thompson, 3rdEdition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.
4. Power System stability & control, PrabhaKundur,TMH

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

DIGITAL CONTROL SYSTEMS

Lecture – Tutorial:	4 – 1	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To understand the concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.
- The theory of z–transformations and application for the mathematical analysis of digital control systems
- To represent the discrete–time systems in state–space model and evaluation of state transition matrix,
- To examine the stability of the system using different tests
- To study the conventional method of analyzing digital control systems in the w–plane.
- The design of state feedback control by the pole placement method.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain advantages of discrete time control systems and the "know how" of various associated accessories
CO2	Evaluate mathematical analysis of discrete systems (Z-transforms)
CO3	Represent the discrete–time systems in state–space model and evaluation of state transition matrix.
CO4	Stability criterion for digital systems and methods adopted for testing the same are explained.
CO5	Explain conventional method of analyzing digital control systems in the w–plane
CO6	Design of state feedback control by "the pole placement method."

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2	2					3	2			
CO2	3	2	3					2	2			
CO3	3	2	2					2	2			
CO4	3	2	2					3	2			
CO5	2	2	1					2	2			
CO6	2	2	1					2	2			

UNIT I

INTRODUCTION AND SIGNAL PROCESSING :Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Continuous and Discrete Time Signals – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

Z–TRANSFORMATIONS: z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses

UNIT II

STATE SPACE ANALYSIS AND THE CONCEPTS OF CONTROLLABILITY AND OBSERVABILITY:
State space representation of discrete time systems – Solving Discrete Time state space equations – State transition matrix and its properties .problems
Discretization of continuous time state equations – Concepts of controllability and observability – Tests(without proof). problems

UNIT III

STABILITY ANALYSIS: Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips .
STABILITY CRITERION – Modified Routh's stability criterion and Jury's stability test.
problems

UNIT IV

DESIGN OF DISCRETE–TIME CONTROL SYSTEMS BY CONVENTIONAL METHODS: Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane.
STATE FEEDBACK CONTROLLERS : state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text books:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

References:

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

ELECTRICAL DISTRIBUTION SYSTEMS

Lecture – Tutorial:	4 – 1	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To understand the concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.
- The theory of z-transformations and application for the mathematical analysis of digital control systems
- To represent the discrete–time systems in state–space model and evaluation of state transition matrix,
- To examine the stability of the system using different tests
- To study the conventional method of analyzing digital control systems in the w–plane.
- The design of state feedback control by the pole placement method.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain advantages of discrete time control systems and the "know how" of various associated accessories
CO2	Evaluate mathematical analysis of discrete systems (Z-transforms)
CO3	Represent the discrete–time systems in state–space model and evaluation of state transition matrix.
CO4	Stability criterion for digital systems and methods adopted for testing the same are explained.
CO5	Explain conventional method of analyzing digital control systems in the w–plane
CO6	Design of state feedback control by "the pole placement method."

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2	2					3	2			
CO2	3	2	3					2	2			
CO3	3	2	2					2	2			
CO4	3	2	2					3	2			
CO5	2	2	1					2	2			
CO6	2	2	1					2	2			

UNIT I

General Concepts

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the

load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial).

Substations

Location of substations: Rating of distribution substation – Service area with 'n' primary feeders – Benefits and methods of optimal location of substations.

UNIT II

Distribution Feeders

Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

System Analysis

Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems - Three phase balanced primary lines.

UNIT III

Protection

Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination

Coordination of protective devices: General coordination procedure –Various types of coordinated operation of protective devices - Residual Current Circuit Breaker

UNIT IV

Compensation for Power Factor Improvement

Capacitive compensation for powerfactor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

Voltage Control

Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Text books:

1. "Electric Power Distribution system, Engineering" – by TuranGonen,

References:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

HVDC TRANSMISSION

Lecture – Tutorial:	4 – 1	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To Understand basic concepts of HVDC Transmission.
- To analyze the converter configuration.
- To Know the control of converter and HVDC Transmission.
- To Understand the significance of reactive power control and AC/DC load flow.
- To Know different converter faults, protection and effect of harmonics.
- To leave low pass and high pass filters.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Learn different types of HVDC levels.
CO2	Learn Basic Concepts of HVDC Transmission.
CO3	Know the operation of converters.
CO4	Acquire control concept of reactive power control and AC/DC load flow.
CO5	Understand converter faults, protection and harmonic effects.
CO6	Design low pass and high pass filters.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3	2			
CO3	3	2						3	2			
CO4	3	2						3	2			
CO5	3	2						3	2			
CO6	3	2						3	2			

UNIT I

Basic Concepts: Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

Analysis of HVDC Converters: Choice of converter configuration – analysis of Graetz – characteristics of 6 pulse & 12 pulse converters.

UNIT II

Converter & HVDC System Control: Principle of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system - Starting and stopping of DC link - Power Control.

Reactive Power Control in HVDC: Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies, sources of reactive power-AC Filters – shunt capacitors-synchronous condensers.

UNIT III
Power Flow Analysis In AC/DC Systems: Modeling of DC Links- -Solution of DC load flow –solution of AC-DC Power flow-Simultaneous method-Sequential method. **Converter Fault & Protection**: Converter faults – Protection against over current and over voltage in converter station – surge arresters –smoothing reactors – DC breakers – Audible noise-corona effects on DC lines-Radio interference.
UNIT IV
Harmonics: Generation of Harmonics –Characteristics harmonics, Non-Characteristics harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. **Filters:** Types of AC filters, Design of Single tuned filters –Design of High pass filters.
Text books:
1.HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar,New Age International (P) Limited, and Publishers. 2.HVDC Transmission by S.Kamakshaiah and V.Kamaraju-Tata McGraw–Hill
References:
1. HVDC Transmission – J.Arrillaga. 2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons. 3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications.
E-Resources:
1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/ 3. https://ocw.mit.edu/courses/electrical-engineering- /

HIGH VOLTAGE ENGINEERING

Lecture – Tutorial:	4 – 1	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To understand electric field distribution and computation in different configuration of electrode systems.
- To understand HV breakdown phenomena in gases, liquids and solids dielectrics.
- To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and currents.
- To understand various techniques of AC, DC and Impulse measurement of high voltages and currents.
- To understand the insulating characteristics of dielectric materials.
- To understand the various testing techniques of HV equipments.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
CO2	To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials.
CO3	To acquaint with the techniques of generation of AC,DC and Impulse voltages.
CO4	To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
CO5	To be in a position to measure dielectric property of material used for HV equipment.
CO6	To know the techniques of testing various equipment's used in HV engineering.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3				
CO3	3	2						3				
CO4	3	2							2			
CO5	3	2							2			
CO6	3	2							2			

UNIT I

Introduction to High Voltage Technology

Electric Field Stresses – Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

Break down phenomenon in gaseous, liquid and solid insulation

Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and

commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of solid dielectrics.

UNIT II

Generation of High voltages and High currents

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents – Tripping and control of impulse generators.

UNIT III

Measurement of high voltages and High currents

Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

Non-destructive testing of material and electrical apparatus

Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT IV

High voltage testing of electrical apparatus

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Text books:

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.
2. High Voltage Engineering and Technology by Ryan, IET Publishers.

References:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
3. High Voltage Insulation Engineering by RavindraArora, Wolfgang Mosch, New Age International (P)Limited,1995.

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

LINEAR INTEGRATED CIRCUIT APPLICATIONS

Lecture – Tutorial:	4 – 1	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

- To understand the basic operation &performance parameters of differential amplifiers.
- To understand & learn the measuring techniques & performance parameters of OP-AMP
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using OP-AMP
- To learn the internal structure, operation and applications of different ICs

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design Differential amplifier circuits and gains knowledge in OP-AMPs
CO2	Understand and gains knowledge in various applications of OP-AMPS
CO3	Analyze amplifiers and active filters using Op-amp.
CO4	Design amplifiers and active filters using Op-amp.
CO5	Understand thoroughly the operational amplifiers with linear integrated circuits.
CO6	Understand the structure of commercially available Analog & Digital converters

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	**PO b**	**PO c**	**PO d**	**PO e**	**PO f**	**PO g**	**PO h**	**PO i**	**PO j**	**PO k**	**PO l**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	-	3	2	-	-	2	-	-	-	-	-	-
CO3	2	-	-	3	-	-	-	-	-	-	-	2
CO4	-	2	-	2	-	-	-	-	-	-	-	-
CO5	2	-	3	-	-	-	-	-	-	-	-	2
CO6	3	2	-	-	-	-	-	-	-	-	-	-

UNIT I

Integrated Circuits

Introduction, Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output)

Characteristics of op-amps and Integrated Circuits

Characteristics of OP-Amps, Integrated circuits-Types, Classification, Package Types and temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical

Op-amp specifications, 741 op-amp & its features

UNIT II

Op-Amp parameters

Input & Out put off set voltages & currents, slew rates, CMRR, PSRR, drift, Frequency Compensation technique

Applications of op-amps

Inverting and Non-inverting amplifier, Integrator, Differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Comparators, Multivibrators, Triangular and Square wave generators, Log amplifiers, Anti log amplifiers, Precision rectifiers

UNIT III

Active Filters

Introduction to Butter worth filters – 1st order, 2nd order, LPF - 1st order, 2nd order HPF - 1st order, 2nd order BPF, BRF , all pass filters

Timers and Phase Locked Loops

Introduction to 555 timer, functional diagram, Monostable operation and applications, Astable operation and applications, Schmitt Trigger, PLL - introduction, block schematic, principles

UNIT IV

Digital to analog and Analog to digital Converters

Introduction, basic DAC techniques Weighted resistor DAC, R-2R ladder DAC Inverted R-2R DAC, Different types of ADCs - parallel comparator type ADC, Counter type ADC, successive approximation ADC , Dual slope ADC DAC and ADC Specifications

Text books:

1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987

References:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.
3. Micro Electronics – Millman, McGraw Hill,1988.
4. Operational Amplifiers – C.G. Clayton, Butterworth & Company Publ. Ltd./ Elsevier, 1971.

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

IV Year - I Semester

L T P C
3 1 0 4

DIGITAL IMAGE PROCESSING

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	4	**External Marks:**	60

Prerequisites: Mathematics I & II, Engineering Physics, Linear integrated circuits, Signals and Systems, Analog Communications, Digital Signal Processing.

Course Objectives:

- To introduce the concepts of image processing and basic analytical methods to be used in image processing.
- To familiarize students with image enhancement.
- To introduce different image restoration techniques.
- To introduce the concepts of colour image processing.
- To familiarize the students with image compression techniques.
- To introduce morphological processing and segmentation techniques.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the fundamentals of image processing, necessity for transforms, DFT and its properties, DCT.
CO2	Evaluate techniques for image enhancement.
CO3	Estimate the degradation of an image and apply appropriate restoration techniques.
CO4	Understand the need for colour image processing and learn the fundamentals of colour image processing.
CO5	Understand the need for image compression and learn different techniques to compress image.
CO6	Interpret morphological processing and implement different techniques to segment an image.

Course Content(Syllabus)

UNIT I

PART A: Introduction: Introduction to digital image processing, Fundamental steps in digital image processing, components of an image processing system, Image sensing and acquisition, Representing digital images, Some basic relationships between pixels, An introduction to the mathematical tools used in digital image processing.

PART B: Image transforms and Intensity transformations : Need for transforms, DFT with one variable and two variables, Properties of 2D Discrete Fourier transform, Discrete cosine transform, Basics of intensity transformations and spatial filtering, Some basic intensity transformation functions, Histogram processing.

UNIT II

PART A: Filtering in spatial and frequency domain: Fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters Image smoothing and sharpening using frequency domain filters, Selective filtering in frequency domain filters.

PART B: Image Restoration: A model of the image degradation / Restoration process, Restoration in the presence of noise only Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the

degradation function, Inverse filtering, Minimum mean square error(Wiener) filtering.

UNIT III

PART A: Color image processing: Color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color.

PART B: Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, symbol based coding, Predictive coding , Wavelet coding, color image compression.

UNIT IV

PART A: Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, The Hit or miss transformation, Some basic morphological algorithms, Gray scale morphology, Some basic gray scale morphological algorithms.

PART B: Image segmentation: Fundamentals, point, line, edge detection, Basic edge detection, thresholding, region –based segmentation.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

REFERENCES:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	-	-	3	-	-	-	-	-	-	-
CO2	3	2	-	2	2	-	-	-	-	-	-	-	-	3
CO3	-	3	2	-	-	3	-	-	-	-	-	-	3	-
CO4	3	2	-	3	-	-	-	3	1	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	2	-	-	3	-
CO6	-	2	-	3	2	-	-	-	-	3	-	-	-	-

Skill Oriented Course: ELECTRICAL ENGINEERING WORKSHOP

Lecture – Tutorial:	3-0	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

List of experiments

Any TEN of the following Experiments are to be conducted

1. Study of various Electrical Symbols and Tools.
2. One-Way and Two-Way Control.
3. GODOWN Wiring.
4. Wiring of Power Distribution Arrangement using 1-Φ MCB distribution board with ELCB, Main Switch and Energy Meter for calculating Power and Power Factor.
5. Hospital Wiring.
6. Tube Light Wiring.
7. Troubleshooting of Electrical Equipments (Tube Light and Fan).
8. Measurement of Voltage, Current and Power in DC Circuit.
9. CRO, Function Generator and Power Supply.
10. Resistors, Capacitors and Digital Multimeters.
11. Moving Coil, Moving Iron, Electro Dynamo and Induction Type Meters.
12. Assembling Electrical Components on Bread-Board.
13. V-I Characteristics of LED.
14. Measurement of Earth Resistance.
15. Identification of various semi conductor devices.

POWER SYSTEMS LAB

Lecture – Tutorial:	3-0	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

List of experiments

The following experiments are compulsory

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Direct method.
3. ABCD parameters of Transmission line.
4. Dielectric strength of Transformer oil.
5. Calibration of Tong Tester.
6. Load flow studies using Gauss-seidel method
7. Load flow studies using N-R method.
8. Load frequency control without feedback control
9. Load frequency control with feedback control
10. Economic load dispatch without losses

The following experiments are done beyond the syllabus

1. Economic load dispatch without losses
2. Sequence impedances of 3 phase Alternator by Fault Analysis.

Skill Oriented Course: ELECTRICAL ENGINEERING WORKSHOP

Lecture – Tutorial:	3-0	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

List of experiments

Any TEN of the following Experiments are to be conducted

1. Study of various Electrical Symbols and Tools.
2. One-Way and Two-Way Control.
3. GODOWN Wiring.
4. Wiring of Power Distribution Arrangement using 1-Φ MCB distribution board with ELCB, Main Switch and Energy Meter for calculating Power and Power Factor.
5. Hospital Wiring.
6. Tube Light Wiring.
7. Troubleshooting of Electrical Equipments (Tube Light and Fan).
8. Measurement of Voltage, Current and Power in DC Circuit.
9. CRO, Function Generator and Power Supply.
10. Resistors, Capacitors and Digital Multimeters.
11. Moving Coil, Moving Iron, Electro Dynamo and Induction Type Meters.
12. Assembling Electrical Components on Bread-Board.
13. V-I Characteristics of LED.
14. Measurement of Earth Resistance.
15. Identification of various semi conductor devices.

IPR & Patents

Lecture – Tutorial:	2-0	Internal Marks:	40
Credits:	0	External Marks:	60

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
- Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Course Outcomes:

- IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
- Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.

Upon successful completion of the course, the student will be able to:

CO1	To know the importance of Intellectual property rights
CO2	To know the importance which plays a vital role in advanced Technical disciplines.
CO3	To know the importance which plays a vital role in advanced Scientific disciplines.
CO4	Imparting IPR protections
CO5	Imparting IPR regulations for further advancement
CO6	Familiar with latest developments

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3	2			
CO3	3	2						3	2			
CO4	3	2						3	2			
CO5	3	2						3	2			
CO6	3	2						3	2			

UNIT I

Introduction to Intellectual Property Rights (IPR) Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

UNIT II

Copyrights and Neighboring Rights Introduction to Copyrights – Principles of

Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers – Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act.

UNIT III

Patents Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

UNIT IV

Trademarks Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities - Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Text books:

1.Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
2. Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.

References:

1. PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
3. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
4. Cyber Law - Texts & Cases, South-Western's Special Topics Collections.
5. R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
6. M.Ashok Kumar and Mohdlqbal Ali: Intellectual Property Rights, Serials Pub.

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

Lecture – Tutorial:	4 – 2	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To learn the basics of power flow control in transmission lines using FACTS controllers
- To explain operation and control of voltage source converter.
- To understand compensation methods to improve stability and reduce power oscillations of a power system.
- To learn the method of shunt compensation using static VAR compensators.
- To learn the methods of compensation using series compensators
- To explain operation of Unified Power Flow Controller (UPFC).

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand power flow control in transmission lines using FACTS controllers
CO2	Explain operation and control of voltage source converter
CO3	Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
CO4	Explain the method of shunt compensation using static VAR compensators.
CO5	Understand the methods of compensations using series compensators.
CO6	Explain operation of Unified Power Flow Controller (UPFC).

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						1				
CO2	2	2	1					2	1			
CO3	3	2	1						1			
CO4	3	2	1					2	2			
CO5	2	2						2	2			
CO6	2	2	1					2	2			

UNIT I

Introduction to FACTS:

Power flow in an AC System – Loading capability limits –stability considerations – Basic types of FACTS controllers – Benefits from FACTS controllers

Voltage source and Current source converters

Concept of voltage source converter (VSC) – Single phase bridge converter – Three–phase full wave bridge converter – Transformer Connections for 12-Pulse Operation, 24 and48-PulseOperation – Current source converter – Thyristor based converters, CurrentSourced Converter with Turn off Devices –Comparison of current source converter with voltage source converter.

UNIT II

Shunt Compensators–1

Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

UNIT III

Shunt Compensators–2

Thyristor Switched Capacitor (TSC)–Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM): The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

UNIT IV

Series Compensators

Static series compensators: Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor-controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

Combined Controllers

Schematic and basic operating principles of Unified Power Flow Controller (UPFC). – Application on transmission lines.

Text books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi

References:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

ENERGY AUDIT, CONSERVATION & MANAGEMENT

Lecture – Tutorial:	4 – 2	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To Estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems
- To understand Economic Aspects and Financial Analysis
- To calculate life cycle costing analysis and return on investment on energy efficient technologies

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain energy efficiency, conservation and various technologies.
CO2	Design energy efficient lighting systems
CO3	Power factor of systems and propose suitable compensation techniques , audit instruments
CO4	Explain energy conservation in HVAC systems
CO5	Explain economic aspects and financial analysis
CO6	Calculate life cycle costing analysis and return on investment on energy efficient technologies

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						1				
CO2	2	2	1					2	1			
CO3	3	2	1						1			
CO4	3	2	1					1	2			
CO5	2	2										
CO6	2	2										

UNIT I

BASIC PRINCIPLES OF ENERGY AUDIT AND MANAGEMENT :Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management

UNIT II

LIGHTING: Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam.

POWER FACTOR AND ENERGY INSTRUMENTS :Power factor – Methods of improvement – Location of capacitors Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer

UNIT III

Space Heating and Ventilation :Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods. Energy conservation methods

Economic Aspects and Financial Analysis: Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money, – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis

UNIT IV

COMPUTATION OF ECONOMIC ASPECTS: Need of investment, appraisal and criteria - Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment – Numerical examples.

Text books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

References:

1. Energy Management By W.R. Murphy & G. Mckay Butter Worth, Elsevier Publications. 2012
2. Electric Energy Utilization And Conservation By S C Tripathy, Tata Mcgraw Hill Publishing Company Ltd. New Delhi.
3. Energy Management By Paul O' Callaghan, Mc–Graw Hill Book Company–1st Edition, 1998.
4. Energy Management Hand Book By W.C.Turner, John Wiley And Sons.
5. Energy Management And Conservation –K V Sharma And P.venkataseshaiah-I K International Publishing House Pvt.Ltd,2011.
6. Http://Www.Energymanagertraining.Com/Download/Gazette_Of_Indiapartiiseci37_25-08-2010.Pdf

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

POWER SYSTEM REFORMS

Lecture – Tutorial:	4 – 2	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To study fundamentals of power system deregulation and restructuring.
- To study available transfer capability.
- To study congestion management
- To study various electricity pricing methods.
- To study operation of power system in deregulated environment.
- To study importance of Ancillary services management.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	To study fundamentals of power system deregulation and restructuring
CO2	To study available transfer capability.
CO3	To study congestion management
CO4	To study various electricity pricing methods.
CO5	To study operation of power system in deregulated environment
CO6	To study importance of Ancillary services management.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3	2			
CO3	3	2						3				
CO4	3	2						3				
CO5	3	2						3				
CO6	3	2						3	2			

UNIT I

Over view of key issues in electric utilities Introduction – Restructuring models – Independent system operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.
Available Transfer Capability (ATC) Structure of OASIS – Processing of Information – Transfer capability on OASIS – Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations – Methodologies to calculate ATC.

UNIT II

Congestion Management Introduction to congestion management – Methods to relieve congestion

UNIT III

Electricity Pricing: Introduction – Electricity price volatility electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short–time

price forecasting.

UNIT IV

Power system operation in competitive environment: Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a GENCO.
Ancillary Services Management: Introduction – Reactive power as an ancillary service – A review – Synchronous generators as ancillary service providers.

Text books:

1.Kankar Bhattacharya, Math H.J. Boller, JaapE.Daalder, 'Operation of Restructured Power System' Kluver Academic Publisher – 2001.

2. Mohammad Shahidehpour, and Muwaffaqalomoush, – "Restructured electrical Power systems" Marcel Dekker, Inc. 2001

References:

1. Loi Lei Lai; "Power system Restructuring and Deregulation", Jhon Wiley & Sons Ltd., England.
2. Electrical Power Distribution Case studies from Distribution reform, upgrades and Management (DRUM) Program, by USAID/India, TMH

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

SPECIAL ELECTRICAL MACHINES

Lecture – Tutorial:	4 – 2	Internal Marks:	40
Credits:	3	External Marks:	60

Course Objectives:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor.
- To explain the theory of travelling magnetic field
- To explain the applications of linear motors.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	To explain theory of operation and control of switched reluctance motor.
CO2	To explain the performance and control of stepper motors, and their applications
CO3	To describe the operation and characteristics of permanent magnet dc motor.
CO4	To distinguish between brush dc motor and brush less dc motor.
CO5	To explain the theory of travelling magnetic field
CO6	To explain the applications of linear motors.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1– Low, 2- Medium, 3 – High)

	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	3	2						3				
CO2	3	2						3	2			
CO3	3	2						3	2			
CO4	3	2						3	2			
CO5	3	2						3	2			
CO6	3	2						3	2			

UNIT I

Permanent magnet materials and PMDC motors Introduction-classification of permanent magnet materials used in electrical machines-minor hysteresis loop and recoil line-Stator frames of conventional dc machines-Development of electronically commutated dc motor from conventional dc motor-Permanent-magnet materials and characteristics-B-H loop and demagnetization characteristics-Temperature effects: reversible and irreversible losses-high temperature effects-Mechanical properties, handling and magnetization-Application of permanent magnets in motors-power density-severity of operation duty.

UNIT II

Stepper Motors Classification of stepper motors – Hybrid and Variable Reluctance Motor (VRM) - Construction and principle of hybid type synchronous stepper motor –

Different configuration for switching the phase windings control circuits for stepper motors – Open loop and closed loop control of 2-phase hybrid stepping motor. Construction and principle of operation of Variable Reluctance Motor (VRM) – Single stack and multiple stack – Open loop control of 3- phase VR Stepper Motor- Applications.

UNIT III

Switched Reluctance Motors Construction – Comparison of conventional and switched reluctance motors – Design of stator and rotor pole arcs – Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.
Square Wave Permanent Magnet Brushless :DC Motor Types of constructions – Surface mounted and interior type permanent magnet – Principle of operation of BLDC motor– Torque speed characteristics – Performance and efficiency

UNIT IV

Construction– principle of operation–Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one sided LIM with back ironequivalent circuit of LIM.

Text books:

1. Special electrical Machines, K.VenkataRatnam, University press, 2009, New Delhi.

References:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford

E-Resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/
3. https://ocw.mit.edu/courses/electrical-engineering- /

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

II YEAR I SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A2100201	BSC	Vector calculus, Fourier Transforms and Partial Differential Equations	3	-	-	3
2	20A2102401	PCC	Electronic Devices and Circuits	3	-	-	3
3	20A2102402	PCC	Electrical Circuit Analysis-II	3	-	-	3
4	20A2102403	PCC	DC Machines and Transformers	3	-	-	3
5	20A2102404	PCC	Electro Magnetic Fields	3	-	-	3
6	20A2102491	PCC	Electrical Circuits Lab	-	-	3	1.5
7	20A2102492	PCC	DC Machines and Transformers Lab	-	-	3	1.5
8	20A2102493	PCC	Electronic Devices and Circuits Lab	-	-	3	1.5
9	20A2102991	SC	**Skill oriented course:** Design of Electrical Circuits using Engineering Software Tools	-	-	4	2
10	20A2102802	MC	Professional Ethics & Human Values	2	-	-	0
							TOTAL CREDITS = 21.5

Category	Credits
Basic Science Course	3
Professional Core Courses	16.5
Skill advanced course/ Soft skill course	2
Mandatory Course	0
TOTAL CREDITS	**21.5**

Dr. N. SAMBASIVA RAO
B.Tech, M.Tech, Ph.D, MISTE
Head of the Department & Professor of EEE
NRI INSTITUTE OF TECHNOLOGY (KN)

VECTOR CALCULUS, FOURIER TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Course Objectives:

- To familiarize the complex variables.
- To familiarize the students with the foundations of probability and statistical methods
- To equip the students to solve application problems in their disciplines.

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	
CO2	
CO3	
CO4	
CO5	
CO6	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT I

Functions of a complex variable and Complex integration:

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method. Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT II

Series expansions and Residue Theorem:

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – Essential –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)\,dx$ and

UNIT III

Probability and Distributions:

Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT IV

Sampling Theory:

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions – Introduction to t, 2 χ and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

Tests of Hypothesis:

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Miller and Freund's, Probability and Statistics for Engineers,Pearson,7th edition, 2008.

REFERENCE BOOKS:

1.J. W. Brown and R. V. Churchill, Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand & Sons Publications, 2012.
3. Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
4. Shron L.Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
5. Sheldon, M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4thEdition, Academic Foundation,2011

SKILL ORIENTED COURSE

DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	-
Credits:	2	**External Marks:**	50

Course Objectives:

- To Learn the fundamentals of MATLAB Tools
- To generate various waveform signals and sequences
- To verify and simulate various electrical circuits using Mesh and Nodal Analysis
- To verify and simulate various theorems
- To verify and simulate RLC series and parallel resonance.
- To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.

List of Experiments

(Any 10 of the following experiments are to be conducted)

Note: MATLAB/SMULINK fundamentals shall be explained during the first week before starting of the Lab course

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.

2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power.

3. Verification of Kirchhoff's current law and voltage law using simulation tools.

4. Verification of mesh analysis using simulation tools.

5. Verification of nodal analysis using simulation tools.

6. Determination of average value, rms value, form factor, peak factor of sinusoidal wave, square wave using simulation tools.

7. Verification of super position theorem using simulation tools.

3.Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B : Full-wave Rectifier

4.BJT Characteristics (CE Configuration)

Part A: Input Characteristics

Part B: output Characteristics

5.FET Characteristics

Part A: Drain Characteristics

Part B: Transfer Characteristics

6.SCR Characteristics

7.UJT Characteristics

8.MOSFET Characteristics

9.Transistor Biasing

10. Measurement of electrical quantities using CRO

11. BJT-CE Amplifier

12.Emitter Follower –CC Amplifier

13.FET-CS Amplifier

Equipment required:

1.Regulated Power supplies

2.Analog/Digital Storage Oscilloscopes

3.Analog/Digital Function Generators

4.Digital Multi-meters 5.Decade Resistance Boxes/Rheostats

6.Decade Capacitance Boxes

7.Ammeters (Analog or Digital)

8.Voltmeters (Analog or Digital)

9.Active & Passive Electronic Components

8. Verification of reciprocity theorem using simulation tools.

9. Verification of maximum power transfer theorem using simulation tools.

10. Verification of Thevenin's theorem using simulation tools.

11. Verification of Norton's theorem using simulation tools.

12. Verification of compensation theorem using simulation tools.

13. Verification of Milliman's theorem using simulation tools.

14. Verification of series resonance using simulation tools.

15. Verification of parallel resonance using simulation tools.

16. Verification of self inductance and mutual inductance by using simulation tools.

PROFESSIONAL ETHICS & HUMAN VALUES

Lecture – Tutorial:	2-0 Hours	**Internal Marks:**	30
Credits:	0	**External Marks:**	70

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	
CO2	
CO3	
CO4	
CO5	
CO6	

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

UNIT I

Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

II YEAR II SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A2205301	ESC	Python Programming	3	-	-	3
2	20A2202401	PCC	Digital Electronics	3	-	-	3
3	20A2202402	PCC	Power System-I	3	-	-	3
4	20A2202403	PCC	Induction and Synchronous Machines	3	-	-	3
5	20A2200101	HSC	Managerial Economics & Financial Analysis	3	-	-	3
6	20A2205391	ESC	Python Programming Lab	-	-	3	1.5
7	20A2202491	PCC	Induction and Synchronous Machines Lab	-	-	3	1.5
8	20A2202492	PCC	Digital Electronics Lab	-	-	3	1.5
							TOTAL CREDITS = 19.5

Category	Credits
Engineering Science Course	4.5
Professional Core Courses	12
Humanities and Social Sciences Course	3
TOTAL CREDITS	**19.5**

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PYTHON PROGRAMMING

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Course Objectives:

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

UNIT I

Introduction:

Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries:

Lists, Defining Simple Functions, Dictionaries Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function. Modules: Modules, Standard Modules, Packages.

UNIT IV
File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations **Object Oriented Programming:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPs support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism
UNIT V
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources. Programming: Introduction to Programming Concepts with Scratch.
TEXT BOOKS:
1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2/e, 2011.
REFERENCE BOOKS:
1) Introduction to Python Programming, Gowrishankar S., VeenaA, CRC Press, 2nd Edition, 2019. 2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 1st Edition, 2012.
E-RESOURCES:
1) https://www.tutorialspoint.com/python3/python_tutorial.pdf

DIGITAL ELECTRONICS

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Course Objectives:

- To solve a typical number base conversion and analyze new error coding techniques.
- Theorems and functions of Boolean algebra and behavior of logic gates.
- To optimize logic gates for digital circuits using various techniques.
- To understand concepts of combinational circuits.
- To develop advanced sequential circuits.

UNIT I

Review of Number Systems & Codes:

Representation of numbers of different radix, conversion from one radix to another radix, r- 1's complements and r's complements of signed members. Gray code,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc., Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.

Boolean theorems and logic operations

Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.

UNIT II

Minimization Techniques:

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method.

Combinational Logic Circuits Design:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit

UNIT III

Combinational Logic Circuits

Design Using MSI &LSI: Design of encoder, decoder, multiplexer and demultiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder

Introduction of PLD's:

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions.

UNIT IV

Sequential Circuits-I:

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion

from one flip-flop to another flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

UNIT V

Sequential Circuits -II:

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator and sequence detector circuits, Races and Hazards.

TEXT BOOKS:

1. Switching and finite automata theory:ZviKohavi, Niraj K. Jha,Cambridge University Press, 3rd Edition, 2009.
2. Digital Design by Morris Mano, Prentice Hall India, 5th Edition.

REFERENCE BOOKS:

1. Digital Principles and Applications by Leach , Malvino , Saha, Mc-Graw Hill, 8th Edition, 2014.
2. Switching Theory and Logic Design by A. Anand Kumar, PHI learning, 3rd edition.
3. Introduction to Switching Theory and Logic Design – Fredriac J Hill, Gerald R Peterson, 3rdEdition, John Willey and Sons Inc,
4. Fundamentals of Logic Design by Charles H. RothJr., Cengage Learning, 7th edition,2013.

INDUCTION AND SYNCHRONOUS MACHINES LAB

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	35
Credits:	1.5	**External Marks:**	50
Course Objectives:			

24)Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.

25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26) Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

27) Write a class called Product. The class should have fields called name, amount, and holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method get_price that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called make_purchase that receives the number of items to be bought and decreases amount by that much.

28) Write a class called Time whose only field is a time in seconds. It should have a method called convert_to_minutes that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

29) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c. feet() and should get 0.75 as the result.

30) Write a Python class to implement pow(x,n).

31) Write a Python class to reverse a string word byword.

32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.

33) Write a program to demonstrate Try/except/else.

34) Write a program to demonstrate try/finally and with/as

- Speed control methods of three-phase induction motors.
- Performance characteristics of three-phase and single-phase induction motors.
- Principles of power factor improvement of single-phase induction motor.
- Voltage regulation calculations of three–phase alternator by various methods,
- Performance curves of three-phase synchronous motor.

List of Experiments

(Any 10 of the following experiments are to be conducted)

1. Performance characteristics of a three- phase Induction Motor by conducting Brake test

2. Determination of equivalent circuit parameters, efficiency and regulation of a three phase Induction motor by conducting No–load & Blocked rotor tests

3. Determination of Regulation of a three–phase alternator by using synchronous impedance & m.m.f. methods

4. Determination of Regulation of a three–phase alternator by using Potier triangle method

5. Determination of V and Inverted V curves of a three phase synchronous motor.

6. Determination of Xd and Xq of a salient pole synchronous machine

7. Speed control of three phase induction motor by V/f method.

8. Determination of equivalent circuit parameters of single phase induction motor

9. Determination of efficiency of three-phase alternator by loading with three phase induction motor.

10. Power factor improvement of single-phase induction motor by using capacitors.

11. Parallel operation of three-phase alternator under no-load and load conditions

12. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

13. Starting of single-phase Induction motor by using capacitor start and capacitor start run methods.

14. Determination of efficiency of a single-phase Induction Motor by conducting Brake test.

DIGITAL ELECTRONICS LAB

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	35
Credits:	1.5	**External Marks:**	50

Course Objectives:
➢ To know the concept of Boolean laws for simplifying the digital circuits. ➢ To understand the concepts of flipflops. ➢ To understand the concepts of counters. ➢ To analyze and design various circuits.

List of Experiments

(Any 10 of the following experiments are to be conducted)

1. Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR

2. Design a simple combinational circuit and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit

3. Verification of functional table of 3 to 8 line Decoder / De-multiplexer

4. 4 variable logic function verification using 8 to 1 multiplexer.

5. Design full adder circuit and verify its functional table.

6. Design full Subtractor circuit and verify its functional table.

7. Verification of functional tables of Flip-Flops

8. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verify output

9. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output

10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms.

11. Design MOD – 10 ripple counter using T- Flip-Flop and verify the result and Sketch the output waveforms

12. Design MOD – 8 synchronous counter using D Flip-Flop and verify the result and Sketch the output waveforms.

SKILL ORIENTED COURSE

IOT APPLICATIONS OF ELECTRICAL ENGINEERING

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	-
Credits:	2	**External Marks:**	50

Course Objectives:

- To understand fundamentals of various technologies of Internet of Things.
- To know various communication technologies used in the Internet of Things.
- To know the connectivity of devices using web and internet in the IoT environment.
- To understand the implementation of IoT by studying case studies like Smart Home,Smart city, etc.

List of Experiments

(Any 10 of the following experiments are to be conducted)

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.

2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.

3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.

4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.

5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi

6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.

7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.

8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to thingspeak cloud.

9. 7 Segment Display

10. Analog Input & Digital Output

11. Night Light Controlled & Monitoring System

12. Fire Alarm Using Arduino 13. IR Remote Control for Home Appliances

14. A Heart Rate Monitoring System 15. Alexa based Home Automation System

NRI INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR FOURTH YEAR B. TECH PROGRAMME

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	HSS	Industrial Engineering and Management	3	0	0	3	40	60	100	3
2	PC	Introduction to CAD/CAM	3	0	0	3	40	60	100	3
3	PC	Metrology	3	0	0	3	40	60	100	3
4	OE	**Open Elective – IV** 1.Nano Technology 2.Additive Manufacturing	3	0	0	3	40	60	100	3
5	PE	**Professional Elective – III** 1. Unconventional Machining Process 2. Power Plant Engineering 3. Mechatronics 4. Advanced Mechanics of Materials	3	0	0	3	40	60	100	3
6	PE	**Professional Elective – IV** 1. Mechanical Vibrations 2. Introduction to Composite materials 3. Refrigeration & Air-conditioning 4. Jet & Rocket Propulsion Engineering	3	0	0	3	40	60	100	3
7	LC	Instrumentation and Metrology Lab	0	0	2	2	40	60	100	1.5
8	LC	Computational Fluid Dynamics Lab	0	0	2	2	40	60	100	1.5
9	PR	Term Paper/Internship	0	0	1	1	40	60	100	1.5
Total			18	0	6	24	320	480	800	22.5

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POTHAVARAPPADU (Vill)
Agiripalli (Mdl), Krishna Dist

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	PE	**Professional Elective – V /MOOCS** 1. Nano Technology 2. Introduction to Robotics 3. Energy Conservation and Management 4. Computer Graphics andGeometrical Modeling	3	0	0	3	40	60	100	3
2	PE	**Professional Elective – VI /MOOCS** 1. Design for Manufacturing 2. Automobile Engineering 3. Metal Forming Process 4. Project Management	3	0	0	3	40	60	100	3
3	PR	Major Project				18	80	120	200	8
Total			6	0	0	24	160	240	400	14

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

Head, Mechanical Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl), Krishna Dist.

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR FOURTH YEAR B. TECH PROGRAMME

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	HSS	Industrial Engineering and Management	3	0	0	3	40	60	100	3
2	PC	Introduction to CAD/CAM	3	0	0	3	40	60	100	3
3	PC	Metrology	3	0	0	3	40	60	100	3
4	OE	**Open Elective – IV** 1.Nano Technology 2.Additive Manufacturing	3	0	0	3	40	60	100	3
5	PE	**Professional Elective – III** 1. Unconventional Machining Process 2. Power Plant Engineering 3. Mechatronics 4. Advanced Mechanics of Materials	3	0	0	3	40	60	100	3
6	PE	**Professional Elective – IV** 1. Mechanical Vibrations 2. Introduction to Composite materials 3. Refrigeration & Air-conditioning 4. Jet & Rocket Propulsion Engineering	3	0	0	3	40	60	100	3
7	LC	Instrumentation and Metrology Lab	0	0	2	2	40	60	100	1.5
8	LC	Computational Fluid Dynamics Lab	0	0	2	2	40	60	100	1.5
9	PR	Term Paper/Internship	0	0	1	1	40	60	100	1.5
Total			18	0	6	24	320	480	800	22.5

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	PE	**Professional Elective – V /MOOCS** 1. Nano Technology 2. Introduction to Robotics 3. Energy Conservation and Management 4. Computer Graphics andGeometrical Modeling	3	0	0	3	40	60	100	3
2	PE	**Professional Elective – VI /MOOCS** 1. Design for Manufacturing 2. Automobile Engineering 3. Metal Forming Process 4. Project Management	3	0	0	3	40	60	100	3
3	PR	Major Project				18	80	120	200	8
Total			6	0	0	24	160	240	400	14

L - LECTURE T – TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

IV B. Tech I Semester

18A4103401

INDUSTRIAL ENGINEERING & MANAGEMENT

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of Engineering mathematics, probability, and statistics

Course Objectives:

1. To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics and the domain knowledge of Industrial Management and Engineering.
2. To produce graduates with the ability to adopt a system approach to design, develop, implement, and innovate integrated systems that include people, materials, information, equipment, and energy.
3. To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.
4. To enable students to understand their role as engineers and their impact to society at the national and global context.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	acquire fundamental knowledge of Industrial management and its importance overview of scientific principles of management, various tools of Industrial Engineering & Productivity measurement
CO2	understand the concept of system approach and different types of production layouts, process layouts and acquire the domain knowledge of maintenance
CO3	understand different types of production, work study, method study, work measurement techniques and design a system, component, or process, and synthesize solutions to achieve desired needs
CO4	identify the role of statistics in engineering problem solving process, use of graphical techniques in data analysis
CO5	use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
CO6	Use the techniques and tools necessary to reduce cost of a product without compromising quality, reliability & performance, and function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3							2	1			
CO2			3	1	2						1	
CO3			1		3	2						
CO4		3	2		1							

CO5	2				3					1	
CO6	2				1					3	

UNIT I

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y, Fayol's principles of management.

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive, and breakdown maintenance.

UNIT II

OPERATIONS MANAGEMENT: Importance, types of production, applications, workstudy, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs

VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

UNIT III

STATISTICAL QUALITY CONTROL: Quality control, its importance, SQC, attribute sampling inspection with single and double sampling, Control charts – X and R – charts X AND S charts and their applications, numerical examples.

TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications, ISO quality systems. six sigma – definition, basic concepts.

UNIT IV

RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

PROJECT MANAGEMENT: PERT, CPM – differences & applications, critical path, determination of floats, importance, project crashing, smoothing and numerical examples.

TEXTBOOKS:

1. Industrial Engineering and management / O.P Khanna/Khanna Publishers.
2. Industrial Engineering and Production Management/MartandTelsang/S.Chand& Company Ltd. New Delhi
3. Maynard's Industrial Engineering Handbook by Harold Maynard and KjellZandin
4. Plant layout & Material Handling-Apple J.M (John Wiley Publishers)

REFERENCE BOOKS:

1. Industrial Management / Bhattacharya DK/Vikas publishers
2. Handbook of Industrial Engineering by GavrielSalvendy
3. Operations Management / J.G Monks/McGrawHill Publishers.
4.Industrial Engineering and Management Science/ T. R. Banga, S. C. Sharma, N.K.Agarwal/KhannaPublishers
5. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.

6. Statistical Quality Control /Gupta/Khanna Publishers
7. Industrial Engineering and Management /NVS Raju/Cengage Publishers

E-RESOURCES:

http://compass.astm.org/CUSTOMERS/license.html

https://ezproxy.wpi.edu/login?url=https://www.engineeringvillage.com/search/quick.url?database=3

IV B. Tech I Semester

18A4103402
INTRODUCTION TO CAD/CAM

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Students are expected to have knowledge on:

1. Computer peripherals like Input and output devices
2. Various display devices, representation methods & Transformations in the Computer Graphics
3. commands used for 2D & 3D drawings in the AutoCAD software
4. Interactive Computer Graphics

Metal Cutting and Machine Tools

Course Objectives:

1. To impart fundamentals of computer aided design and manufacturing.
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.,
3. To understand the fundamentals used to create and manipulate geometric models
4. To get acquainted with the basic CAD software designed for geometric modeling
5. To learn working principles of NC machines, CNC control and part programming & DNC
6. To understand concept of Group Technology, FMS and CIM and interpret the importance of CAQC.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	describe basic structure of CAD workstation, Memory types, input/output devicesand display devices and computer graphics
CO2	acquire the knowledge of geometric modeling and execute the steps required inCAD software for developing 2D &3D models and perform transformations
CO3	understand the construction of database models and geometric modeling features
CO4	understand how to write the part programs for different models by using part programming
CO5	explain features of Group Technology (GT), CAPP & FMS
CO6	illustrateCAQC and CIM concepts

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1	2	3	1	-	-	-	-	-	1
CO2	3	2	1	2	3	1	-	-	-	-	-	1
CO3	2	2	1	2	3	1	-	-	-	-	-	1
CO4	2	2	1	2	3	2	-	-	-	-	-	1
CO5	2	2	1	2	3	2	-	-	-	-	-	1
CO6	2	1	3	-	2	1	-	-	-	-	-	1

UNIT I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices,

storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

UNIT II

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning and solid modeling.

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming. Direct Numerical Control

UNIT III

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types.

FMS: Introduction, Equipment, Tool management systems, Layouts, FMS Control

UNIT IV

COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requirement planning, computer control systems, human labour in manufacturing systems, CIMS benefits.

TEXTBOOKS:

1. CAD/CAM: Principles and Applications: Rao P N, Tata McGraw Hill Higher Education P Ltd 2002
2. CAD/CAM: Groover, Mikell P and Zimmer's Emory W, Prentice Hall India (P) Ltd, 2001
3. CAD/CAM/CIM: Radhakrishnan P, New Age International Publishers 1994

REFERENCE BOOKS:

1. Mastering CAD / CAM / Ibrahim Zeid / McGraw-Hill
2. Principles of Computer Aided Design and Manufacturing / FaridAmirouche / Pearson
3. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson learning, Inc
4. Product manufacturing and cost estimation using CAD/CAE/ KuangHua Chang/Elsevier Publishers
5. CAD/CAM Concepts & applications/Alavala/PHI

E-RESOURCES:

https://www.coursera.org/

https://www.udemy.com/

IV B. Tech I Semester

18A4103403
METROLOGY

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Metallurgy,Machine Design, Physics

Course Objectives:

1. Learn the system of limits, fits, tolerances, and gauge design
2. Know about the linear and angular measuring instruments.
3. know about optical and comparator measuring instruments
4. Understand the principles of surface roughness measurement
5. Understand the flatness measurement and principles of interferometry
6. Learn the gear and screw thread measurement.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design limit gauges, tolerances, and fits for selected product quality.
CO2	Evaluate various devices for linear and angular measurements.
CO3	Outline the operation of optical and comparator measuring instruments
CO4	Evaluate the surface roughness parameters.
CO5	Demonstrate the flatness and interferometer measuring instruments
CO6	Outline the working of gear and screw thread measuring instruments.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1						1			
CO2	1	3	2							1		
CO3	2	1	3									1
CO4	3	2	1								1	
CO5	1	3	2							1		
CO6	2	3	3									1

UNIT I

SYSTEMS OF LIMITS AND FITS:

Introduction, nominal size, tolerance, limits, deviations, fits –Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, deterministic & statistical tolerances, selective assembly. International standard system of tolerances, selection of limits, and tolerances for correct functioning.

LIMIT GAUGES: Taylor's principle – design of go and no-go gauges; plug, ring, snap, gap, taper, profile, and position gauges

LINEAR MEASUREMENT: Length standards, end standards, slip gauges- calibration of the slip gauges, dial indicators, micrometers.

UNIT II

MEASUREMENT OF ANGLES AND TAPERS: Different methods – bevel protractor, angle slip gauges- Angle Dekker- spirit levels- sine bar- sine table, rollers, and spheres used to measure angles and tapers.

COMPARATORS: Types - mechanical, optical, electrical, and electronic, pneumatic comparators and their uses.

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope and uses - autocollimators, optical projector, optical flats, and their uses.

UNIT III

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, Method of measurement of surface finish – Profilograph, Talysurf,

INTERFEROMETRY: Interference of light, Michelson's interferometer, NPL flatness interferometer, and NPL gauge interferometer, laser interferometers, types, DC and AC laser interferometers, applications.

FLATNESS MEASUREMENT: Measurement of flatness of surfaces- instruments used- straight edges- surface plates autocollimator

UNIT IV

GEAR MEASUREMENT: Nomenclature of gear tooth, tooth thickness measurement with gear tooth vernier &flange micrometer, pitch measurement, total composite error and tooth to tooth composite errors, rolling gear tester, involute profile checking

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads- the concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch, and profile thread gauges.

TEXTBOOKS:

1.Engineering Metrology by Mahajan / Dhanpat Rai Publishers.
2.Dimensional Metrology/Connie Dotson/Cengage Learning.
3.Engineering Metrology by R.K.Jain / Khanna Publishers.
4.Engineering Metrology by I.C.Gupta / Dhanpat Rai Publishers.

REFERENCE BOOKS:

1. Engineering Metrology by KL Narayana, Scitech publishers.
2. Engineering Metrology and Measurements by NV Raghavendra, LKrishna Murthy, Oxford publishers
3. Precision Engineering in Manufacturing by R.L.Murthy / New Age.
4. BIS standards on Limits & Fits, Surface Finish, Machine Tool Alignment, etc.

E-RESOURCES:

https://www.npl.co.uk/resources
https://iopscience.iop.org/journal/0957-0233

IV B. Tech I Semester

Course Code:

ADDITIVE MANUFACTURING

(Open Elective – III)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Introduction to CAD/CAM, Material science,

Course Objectives:

1. Student will develop a comprehensive understanding of the fundamentals of additive manufacturing.
2. Student will acquire knowledge on the aspects of materials and their properties used in AM.
3. Student will develop a deep understanding of AM process, monitoring & controlling these processes.
4. Student will recognize the tools used in RP.
5. Student will learn and identify various fields applying AM.
   Student will comprehend and present case studies on AM.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Paraphrase the fundamentals of AM.
CO2	Interpret the materials used in AM.
CO3	Illustrate the AM processes and analyze parameters controlling the AM process.
CO4	Relate the tools used for RP.
CO5	Analyze the application areas of AM
CO6	Discuss and analyze case studies on AM.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3		1									
CO2	3	1	1									1
CO3			1									1
CO4			1	1	3	1						1
CO5			1	1	3	1						1
CO6		1		1	3							1

UNIT I

Introduction: Review of general manufacturing approaches (Casting, Welding, machining), Need - Development of Additive Manufacturing Technology -Principle – AM Process Chain- Classification –Rapid Prototyping- Rapid Tooling – Rapid Manufacturing – Applications- Benefits –Case studies.

Materials used for AM: Types of materials used for AM, Use of multiple materials, multifunctional and graded materials in AM, Role of solidification rate, Evolution of non-equilibrium structure, Structure property relationship, Grain structure and microstructure

UNIT II

Process monitoring and Control for AM:
Defects, Geometry, Temperature, Composition, Phase Transformation
Additive Manufacturing Systems: Liquid based: SLA, SGC; **Solid based:** LOM, FDM; **Powder based:** SLS, 3DP

UNIT III

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT IV

Application of AM for various Industries:
Aerospace, Automobile, Oil and Gas, Agriculture.
Case Studies: (To be presented by students)

TEXTBOOKS:

1. Rapid prototyping: Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific
2. Ian Gibson, David W. Rosen, Brent Stucker, Additive manufacturing technologies: rapid prototyping to direct digital manufacturing Springer, 2010.

REFERENCE BOOKS:

1. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third edition, World Scientific Publishers, 2010.
2. Rapid Manufacturing/ D. T. Pham and S. S. Dimov/ Springer/
3. Wholers Report 2000/Terry Y Wholers/ WholersAassociates.
4. Andreas Gebhardt, "Understanding Additive Manufacturing," Hanser, 2011, ISBN 9783446425521.

E-RESOURCES:

https://libraryblogs.is.ed.ac.uk/eresources/tag/3d-printing-and-additive-manufacturing/
https://www.journals.elsevier.com/additive-manufacturing

IV B. Tech I Semester

18A4103511

UNCONVENTIONAL MACHINING PROCESSES

(Professional Elective – III)

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Manufacturing Technology I, Manufacturing Technology II, Engineering Mechanics

Course Objectives:

1. Student will be able to identify the classification of unconventional machining processes.
2. Student will be to understand the principle, mechanism of metal removal of various unconventional machining processes.
3. Student will study the various process parameters and their effect on the component machined on various unconventional machining processes.
4. Student will design various Hydraulic and Pneumatic circuits.
5. Student will apply basics of digital electronics for various applications of logic gates.
6. Student will relate different logic gates and their role in Programmable logic controllers.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describe unconventional machining methods and working principles of mechanical energy-based processes
CO2	Demonstrate electro-chemical machining principles in grinding, honing and deburring process.
CO3	Explain principle, working, applications and various characteristics of electric discharge machining process.
CO4	Identify the difference between EBM and LBM based on its characteristics, parameters, and accuracy.
CO5	Explain the applications, characteristics and process of plasma arc machining based on MRR and accuracy.
CO6	Compare different types of mechanical finishing process.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3			1	2							
CO2	3			1	2							
CO3	3			1	2							
CO4	3			1	2							
CO5	3			1	2							
CO6	3			1	2							

UNIT I

Introduction: Need for non-traditional machining methods-classification of modern machining processes – considerations in process selection, applications.

Abrasive jet machining, Water jet machining– Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications, and limitations.

UNIT II

Abrasive water jet machining and Ultrasonic machining: Basic principles, equipment, process variables, mechanics of material removal, MRR, application and limitations.

Chemical machining and Electro-Chemical machining (CHM and ECM): Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications. Principles of ECM- equipment's-Surface Roughness and MRR - Process Parameters- ECG and ECH - Applications.

UNIT III

Thermal Metal Removal Processes: General principle and applications of Electric Discharge Machining, Electric Discharge Grinding and wire EDM – Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, applications.

Electron Beam Machining, Laser Beam Machining: Basic principle and theory, mechanics of material removal, process parameters, efficiency & accuracy, applications

UNIT IV

Plasma Machining: Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

Advanced Nano Finishing Processes: Magnetic abrasive finishing, abrasive flow finishing, working principles, equipments, effect of process parameters, applications, advantages and limitations Electro stream drilling and shaped tube electrolytic machining

TEXTBOOKS:

1. Fundamentals of Machining Processes-Conventional and non – conventional processes/ Hassan Abdel – Gawad El-Hafy/CRC Press-2016.
2. Advanced Machining Processes /Vijay.K. Jain/Allied Publishers Pvt. Ltd., New Delhi, 2007

REFERENCE BOOKS:

1. Modern Machining Process / Pandey P.C. and Shah H.S./ TMH.
2. New Technology / Bhattacharya A/ the Institution of Engineers, India 1984.
3. Non-Traditional Manufacturing Processes / Benedict / |
4. Advanced Methods of Machining/Mc Geough/Chapman and Hall, London, 1998
5. Material and Processes in Manufacturing/ Paul De Garmo, J.T.Black, and Ronald. A.Kohser/Prentice Hall of India Pvt. Ltd., 8thEdition, New Delhi , 2001

E-RESOURCES:

http://www.sasurieengg.com/e-course-material/MECH/III-ear%20Sem%206/ME2026%20UMP.pdf
http://home.iitk.ac.in/~nsinha/Non-traditional-machining.pdf

IV B. Tech I Semester

Course Code:

POWER PLANT ENGINEERING

(Professional Elective – III)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Basic Thermodynamics, Applied Thermodynamics & IC Engines and Gas Turbine.

Course Objectives:

1. To impart the Knowledge of sources of energy
2. To enable the Students the Concepts of Different Power Plants
3. To impart the Concepts of Hydroelectric Power Plant
4. To imbibe the Knowledge of Nuclear Power Station
5. To enable the Students the Concepts of Power Plant Instrumentation and Control
6. To impart the Knowledge of Power Plant Economics

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain various types of Coals and Illustrate Dust Collector, Cooling Tower and Heat Rejection Systems
CO2	Outline the Diesel and Gas Turbine Power Plant
CO3	Explain Hydrological Cycle, interflow measurements from Hydrographs
CO4	Explain Working Principle of Nuclear Power Plants, Nuclear Fuels and Reactor Operations
CO5	Explain Cost Factors, Load and Power Distribution Factors
CO6	Summarize the impact of Power Plants on the Environment

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	1	2	3	3	2				3
CO2	3	1	2	1	2	2	2	3				2
CO3	2	3	1	2	1	3	2	2				2
CO4	2	2	1	2	2	2	1	2				3
CO5	2	3	2	1	2	3	2	2				2
CO6	3	1	1	2	1	2	1	1			2	3

UNIT I

Introduction to the sources of energy – resources and development of power in India.

STEAM POWER PLANT: Plant layout, working of different circuits, fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, Combustion: properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, ash handling systems, Dust collectors - cooling towers and heat rejection.

UNIT II

DIESEL POWER PLANT: Plant layout with auxiliaries – fuel supply system, air starting equipment, supercharging.

GAS TURBINE PLANT: Introduction – classification - construction – layout with auxiliaries, combined cycle power plants and comparison.

HYDRO ELECTRIC POWER PLANT: Waterpower – hydrological cycle / flow measurement – drainage area characteristics – hydrographs – storage and pondage – classification of dams and spill ways.

UNIT III

NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – nuclear reactor – reactor operation - Pressurized water reactor, boiling water reactor, sodium-graphite reactor, fast breeder reactor, homogeneous reactor, gas cooled reactor, radiation hazards and shielding – radioactive waste disposal.

COMBINED OPERATIONS OF DIFFERENT POWER PLANTS: Introduction, advantages of combined working, load division between power stations, storage type hydro-electric plant in combination with steam plant, run-of-river plant in combination with steam plant, pump storage plant in combination with steam or nuclear power plant, co-ordination of hydro-electric and gas turbine stations, co-ordination of hydro-electric and nuclear power stations, co-ordination of different types of power plants.

UNIT IV

POWER PLANT INSTRUMENTATION AND CONTROL: Importance of measurement and instrumentation in power plant, measurement of water purity, gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust, measurement of moisture in carbon dioxide circuit,

POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve, definitions of connected load, maximum demand, demand factor, average load, load factor, diversity factor –related exercises. effluents from power plants and Impact on environment – pollutants and pollution standards –methods of pollution control.

TEXTBOOKS:

1. A course in Power Plant Engineering /Arora and Domkundwar/Dhanpatrai & Co.
2. Power Plant Engineering /P.C.Sharma / S.K.Kataria Pub

REFERENCE BOOKS:

1. Power Plant Engineering: P.K.Nag/ II Edition /TMH.
2. Power station Engineering – ElWakil / McGrawHill.
3. An Introduction to Power Plant Technology / G.D. Rai/Khanna Publishers
4. Power Plant Engineering, P.K. Nag, Tata McGraw Hill.
5. Power Plant Engineering, F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras
6.Power Plant Technology El-Vakil, McGraw Hill.

E-RESOURCES:

https://www.freebookcentre.net/Mechanical/Power-Plant-Engineering.html
http://library.ddn.upes.ac.in:8081/upeslib/upeslib/links/ebooks_power.html

IV B. Tech I Semester

Course code-

MECHATRONICS

(Professional Elective – III)

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of Engineering Mathematics, Electronic Devices and Circuits, Digital Electronics

Course Objectives:

1. Student will be able to introduce to integrative nature of Mechatronics.
2. Student will be exposed to the various types of sensors and transducers.
3. Student will understand the fundamentals of solid-state electronic devices.
4. Student will design various Hydraulic and Pneumatic circuits.
5. Student will apply basics of digital electronics for various applications of logic gates.
6. Student will relate different logic gates and their role in Programmable logic controllers.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describe mechatronics system and their elements and levels
CO2	Differentiate various sensors and transducers
CO3	Understand solid state electronic devices, analog signal conditioning
CO4	Demonstrate hydraulic and pneumatic actuating systems
CO5	Understand Digital electronics and Logic gates
CO6	Explain micro controllers and applications of PLC

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3											
CO2	3											
CO3	3											
CO4	2		2		2							
CO5	3											
CO6	2				2							

UNIT I

Introduction: Definition of Mechatronics, Elements & Levels of Mechatronics system, mechatronics design process, System, Measurement System, Control system, Types of control system, Advantages, and disadvantages of mechatronics systems

Sensors and Transducers: Static and Dynamic characteristics of Transducers, displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

UNIT II

Solid state Electronic Devices: PN junction diode, BJT, FET, DIAC, TRIAC and LEDs. Analog signal conditioning - operational amplifiers, noise reduction, types of filters.

Process Controllers: Controller principle, Two-position, Proportional, Integral, Derivative, PI, PD & PID controllers

UNIT III

Hydraulic and Pneumatic Actuating Systems: Fluid systems, Hydraulic systems, and pneumatic systems,Comparison of hydraulic and pneumatic systems, components, control valves, Characteristics and their limitations, Design of Hydraulic and Pneumatic circuits

Digital Electronics and Systems: Digital logic control, Numbering system, Boolean algebra, Logic gates, Karnaugh maps, Applications of logic gates.

UNIT IV

Microcontrollers and Programmable Logic Controllers: Architecture of Microprocessor, Microcontroller, Basic structure of a PLC, PLCs versus Computers, PLC Programming using ladder diagrams, logics, latching, sequencing, timers, relays and counters,

Dynamic models and analogies: Mechanical, Electrical, fluid, and thermal systems, Pneumatic and Hydraulic systems.

TEXTBOOKS:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition
2. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, WBolton, 3/e Pearson Education Press, 2005.

REFERENCE BOOKS:

1. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010.
2. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2004.
3. Mechatronics, Robert H Bishop, CRC Press, 2005.
4. James J Allen, Micro Electromechanical Systems Design, CRC Press Taylor & Francis group, 2005.
5. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010.
6. Mechatronics – Principles and Application / Godfrey C. Onwubolu/Elsevier, Indian print
7. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
8. Mechatronics /Smaili A, Mrad F/ Oxford Higher Education, Oxford University Press

E-RESOURCES:

https://mechatronics.colostate.edu/resources/

https://esearch.sc4.edu/mechatronics/web

IV B. Tech I Semester

Course Code:

ADVANCED MECHANICS OF MATERIALS

(Professional Elective – III)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of Engineering Mathematics, Engineering Mechanics, Strength of Materials

Course Objectives:

1. Find Deflections in fixed and continues beams
2. Understanding stresses in thick cylinders
3. Curved beam stresses with different cross sections
4. Strain energy under different loading conditions

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Calculate deflections in fixed and continuous beams
CO2	Determine the stresses in thick cylinders
CO3	Analyse the curved beams for stresses with different cross sections
CO4	Calculate the stresses in rotating disks
CO5	Determine the Strain Energy under static and gradually applied load
CO6	Determine the Strain Energy under impact and shear stresses

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1								2
CO2	3	3	3	1								2
CO3	3	3	3	1								2
CO4	3	3	3	1								2
CO5	3	3	3	1								2
CO6	3	3	3	1								2

UNIT I

Thick cylinders: Introduction, Stresses in thick Cylindrical shell(Lame's theory), Radial Deflection, Stresses in Compound Cylinders

Fixed beams and continuous beams: Introduction, analysis of fixed beams by Macaulay's method Clapeyron's theorem of three moments, Beams with constant moments of inertia

UNIT II

Curved beams: Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Assumptions for stresses in the bending of curved bars, Stresses in Crane Hook and C-Clamp with Rectangular, circular and trapezoidal cross section

UNIT III

Centrifugal Stresses: Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform strength

UNIT IV

Strain Energy :Resilience, Proof Resilience, Strain energy stored in a body when the

load is applied gradually, Load is applied suddenly, Load is applied with impact, Strain energy stored in a body due to shear stress

TEXTBOOKS:

1. S.S. Rattan, "Strength of Materials", 2nd edition, Tata Mc-Graw Hill Private Limited, New Delhi, 2012
2. "Strength of Materials",Sadhu sing.

REFERENCE BOOKS:

1. James M. Gere, "Mechanics of Materials", 7th edition, Cengage learning India, 2010.
2. S. B. Junarkar, Mechanics of Structures, Charotar Publishers, 2010
3. AdarshSwaroop, "Mechanics of Materials" 1st edition, New Age International Pvt. Ltd, 2012.
4. Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.

E-RESOURCES:

http://www.oup.com/academic/product/advanced-mechanics-of-materials-780195143720?lang=en&cc=cn

https://www.coursera.org/courses?query=mechanics%20of%20materials

IV B. Tech I Semester

Course Code:
NANOTECHNOLOGY
(Open Elective – IV)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Physics, Chemistry, Biology, and Mathematics

Course Objectives:

1. Students will know about band structure, history, and applications of nanotechnology.
2. Students will know about the properties of different materials and their behaviour at nanoscale.
3. Students will know about characterization techniques and tools used at the nanoscale.
4. Students will know about the synthesis and fabrication of materials at nanoscale.
5. Students will know about applications of silicon carbide, alumina, and zirconia.
6. Students will know about the applications of nanomaterials in various fields.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain solids and their band structure and applications of nanotechnology.
CO2	Demonstrate about properties of materials and their behaviour at nanoscale.
CO3	Outline different characterization techniques and tools used at the nanoscale.
CO4	Summarize about synthesis and fabrication of materials at nanoscale.
CO5	Explain about applications of silicon carbide, alumina, and zirconia.
CO6	Outline the applications of nanomaterials in various fields.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2						1			
CO2	3	2	1							1		
CO3	3	2	1									1
CO4	3	1	2								1	
CO5	3	1	2							1		
CO6	3	2	1									1

UNIT I

INTRODUCTION: Basics of Quantum Mechanics, Band Structure in Solids, History, and Scope, Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature the best of nanotechnologist, Challenges, and Future Prospects, Carbon Nano Technology.

PROPERTIES OF MATERIALS:

Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, optoelectronic properties. Effect of size reduction on properties, electronic structure of nanomaterials.

UNIT II

CHARACTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, Small Angle X-ray scattering (SAXS), scanning electron microscopy, Scanning Tunneling Microscope (STM), scanning probe microscopy, transmission electron microscopy, atomic force microscopy, piezo response microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle-resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy., Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT III

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for nanoparticle preparation Bottom-Up Approach Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self-assembly, hydrothermal growth, thin-film growth, Top-Down Approach Ball milling, microfabrication, lithography. Consolidation of Nano powders: Shock wave consolidation, Hot isostatic pressing, and Coldisostatic pressing Spark plasma sintering.

UNIT IV

SILICON CARBIDE: Application of Silicon carbide, Sintering of SiC, sintering of nanoparticles, nanoparticles of alumina and zirconia, wear materials and nanocomposites,

APPLICATIONS OF NANOMATERIALS: Nano-electronics, Micro and Nano-electromechanical systems (MEMS/NEMS), Nano sensors, Nano catalysts, Food, and Agricultural Industries, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water Treatment, and the environment, Nano-medical applications, Nanobiology and a New Methodology in medical diagnostics, Nanomedicine Protocols for nano-drug Administration, Textiles, Paints, Energy, Defense and Space Applications, Nanotribology, Concerns, and challenges of Nanotechnology.

TEXTBOOKS:

1. Nanoscience and nanotechnology by M.S Ramachandra Rao, Shubra Singh, Wiley publishers.
2. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
3. Nano Essentials- T.Pradeep/TMH
4.Textbook of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, BaldevRaj, B.B. Rath, and James Munday, University Press-IIM.

REFERENCE BOOKS:

1. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wiley India Edition, 2012.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell
4. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University Press.

E-RESOURCES:

https://www.hsls.pitt.edu/e-journals/Nanotechnology
https://www.nature.com/nnano/

IV B. Tech I Semester

Course Code:

MECHANICAL VIBRATIONS

(Professional Elective – IV)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of Engineering Mathematics, Engineering Mechanics, Strength of Materials

Course Objectives:

1. To analyse single DOF Systems
2. To analyse Damped Vibrations
3. To understand forced vibrations
4. ToAnalyse 2 DOF Systems

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze single degree freedom system for its natural frequency and vibration response
CO2	Analyze single degree freedom system for its natural frequency and damped vibration response
CO3	Determine response of Single degree freedom systems under harmonic excitations
CO4	Understanding Vibration measuring instruments
CO5	Determine the response of Two-degree freedom systems under free and forced vibrations
CO6	Understanding Dynamic vibration absorber

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	1								2
CO2	3	3	3	1								2
CO3	3	3	3	1								2
CO4	3	3	3	1								2
CO5	3	3	3	1								2
CO6	3	3	3	1								2

UNIT I

Undamped free vibrations of SDOF Systems: Introduction, basic concepts of vibration, importance of vibration study, elements of a vibrating system, types of vibration, methods of vibration analysis, harmonic motion, Equation of motion, free vibration of undamped translational system, free vibration of undamped torsional system, Raleigh's energy method.

Damped free vibrations of SDOF systems: Introduction, types of damping, free vibration with viscous and coulomb damping, logarithmic decrement.

UNIT II

Damped free vibrations of SDOF Systems: introduction, types of damping, free vibration with viscous and coulomb damping, logarithmic decrement.

Harmonically Exited Vibrations: Introduction, equations of motion, response of undamped and damped systems under harmonic excitation, response of a damped system under harmonic motion of the base, response of a damped system under rotating unbalance, vibration, measuring instruments-vibrometer and accelerometer, critical speed

UNIT III

Two Degree of Freedom Systems: Introduction, equations of motion for forced vibration, free vibration analysis of an undamped system, torsional system, coordinate coupling and principal coordinates, forced vibration analysis. Dynamic vibration absorber

UNIT IV

Numerical methods for multi DOF systems:
Maxwell's reciprocal theorem, influence coefficients, Rayleigh's method, Dunkerley's method, stodola method, orthogonality principle, method of matrix iteration and numerical.

TEXTBOOKS:

1. G. K. Grover, Mechanical Vibrations, 8/e, Nem Chand & Bros

REFERENCE BOOKS:

1. L. Meirovich,ElementsofVibrationAnalysis,2/e.TataMcGrawHill,2007.
2. J.S.Raoand
K.Gupta,IntroductoryCourseonTheoryandPracticeofMechanicalVibrations,2/e,New Age International,1999.
3. S.S.Rao,MechanicalVibrations,5/e,PearsonEducationInc.,2011.

E-RESOURCES:

https://nptel.ac.in/courses/112/103/112103112/
https://nptel.ac.in/courses/112/103/112103111/

IV B. Tech I Semester

18A4103522

INTRODUCTION TO COMPOSITE MATERIALS

(Professional Elective – IV)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Engineering Mechanics, Mechanics of Materials.

Course Objectives:

1. Student will know the fundamental concepts of composites.
2. Student will be able to understand the various types of composites .
3. Student will be able to understand the fabrication and manufacturing techniques of composites .
4. Student will understand the joining methods and theories of failures of composites.
5. Student will be in a position to apply the joining techniques and failure theories of composites
6. Student will be able to test the characteristics of composites

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Identify various types of composites.
CO2	Understand the basic concepts of reinforcements.
CO3	Apply the fabrication and manufacturing techniques of composites.
CO4	Understand the joining and theories of failures of composites.
CO5	Select appropriate joining techniques of composites.
CO6	Identify the characteristics of various composites.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3					1					2	
CO2	2		3								1	
CO3		3	2		1							
CO4		2	3									1
CO5	2	-	-	-	3						1	
CO6	2				3						1	

UNIT I

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix.

Types of Reinforcements/Fibers: Role and Selection or reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers, Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc.,

Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential

UNIT II

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC);

Classification based on reinforcements: Fibre Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites

UNIT III

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transfer method, pultrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix performs

Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films

UNIT IV

Joining Methods and Failure Theories: Joining –Advantages and disadvantages of adhesive and mechanically fastened joints. Typical bond strengths

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

TEXTBOOKS:

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy by G. Dieter Mc-Graw Hill
3. Thermal Analysis of Materials by R.F. Speyer, Marcel Decker
4. Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall India.

REFERENCE BOOKS:

[1] Jones, R M, Mechanics of Composite Materials, Scripta Book Co.
[2] Agarwal, B D and Broutman, J. D, Analysis and Performance of Fiber Composites, New York, John Willey and Sons, 1990
[3] Mallik, P. K, Fiber reinforced composites : materials, manufacturing and design, New York- Marcel and Dekker, 1993 (2ndedition)
[4] Arthur, K Kaw, Mechanics of Composite Materials, CRC Press, 1997.
[5] Reddy J N, Mechanics of Laminated Composite Plates, CRC Press
[6] Mallik, P. K, Composite Engineering Hand Book, New York, Marcel and Dekker, Principles of Composite Material Mechanics,
[7] Author: Ronald Gibson An Introduction to Composite Materials, Authors: D. Hull and T.W. Clyne

E-RESOURCES:

https://www.intechopen.com/chapters/71222
https://nptel.ac.in/content/storage2/courses/105108124/pdf/Lecture_Notes/LNm1.pdf

IV B. Tech I Semester

Course Code:

REFRIGERATION & AIR CONDITIONING

(Refrigeration and Psychometric tables and charts allowed)

(Professional Elective – IV)

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Thermodynamics

Course Objectives:

1. To provide an insight of fundamentals of Refrigeration.
2. To impart the basic of Refrigerants and different types of refrigeration systems.
3. To enable the students of methods to improve performance of vapor compression systems.
4. To imbibe the knowledge of steam jet, vapor absorption, thermoelectric and vortex tube systems.
5. To enable the students learn basics and psychometric properties and processes used in Air Conditioning systems.
6. To impart the knowledge of Air Conditioning systems for human comfort conditions.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concepts of refrigeration and their applications.
CO2	Identify eco-friendly refrigerants and use P-H charts to evaluate the performance of refrigerationsystems.
CO3	Explain the methods to improve performance of vapor compression systems.
CO4	Analyze steam jet, vapor absorption, thermoelectric and vortex tube systems
CO5	Analyze air conditioning processes using principles of psychometry.
CO6	Design of Air Conditioning systems for human comfort conditions.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	1				1					
CO2	3	2	1				1					
CO3	3	3	2				1					
CO4	3	3	2				1					
CO5	3	3	1				1					
CO6	3	2	2				3					

UNIT I

FUNDAMENTALS OF REFRIGERATION: Introduction- Necessity and applications, unit of Refrigeration and C.O.P - Heat Engine, Refrigerator and Heat Pump-Types of Refrigeration systems and its Applications.

REFRIGERANTS: Classification of refrigerants- Desirable Properties-Nomenclature-Commonly used refrigerants- Alternate refrigerants –Greenhouse effect, global warming

AIR REFRIGERATION SYSTEM: Introduction-Air refrigeration system working on Reversed Carnot cycle – Air refrigeration system working on Bell Coleman cycle- COP-Open and Dense air systems, Applications.

UNIT II

VAPOUR COMPRESSION REFRIGERATION SYSTEM: Working principle-Simple vapour compression refrigeration cycle – COP- Representation of cycle on T-s and P-h charts- Effect of Sub cooling and Superheating --Actual Vapour compression cycle and its applications.

VCR SYSTEM COMPONENTS: Compressors-Classification-Working -Condensers – Classification-Working-Evaporators –Classification-Working, Expansion devices – Types-Working.

UNIT III

VAPOUR ABSORPTION REFRIGERATION SYSTEM: Description and working of Aqua-Ammonia system- Calculation of maximum COP- Lithium Bromide- Water system-Principle of Operation of three fluid absorption systems, Applications.

STEAM JET REFRIGERATION SYSTEM: Principle of working –Analysis- Applications. and operation of Thermo electric Refrigeration, Vortex tube refrigeration, Adiabatic demagnetization Refrigeration.

PSYCHOMETRY: Introduction- Psychometric properties and relations- Psychometric chart Psychometric Processes-Sensible, Latent and Total heat–Sensible Heat Factor and Bypass Factor.

UNIT IV

HUMAN COMFORT: Thermodynamics of Human Body-Effective temperature–Comfort chart.

AIR CONDITIONING SYSTEMS: Introduction-Components of Air conditioning system-Classification of Air conditioning systems-Central and Unitary systems- Comfort and Industrial air conditioning systems -Summer, Winter and Year-round systems- filters, grills and registers, fans and blowers.

DESIGN OF AIR CONDITION SYSTEMS: Summer air conditioning –ADP-System with Ventilated and re-circulated air with and without bypass factor- RSHF, GSHF and ESHF. Air conditioning Load Calculations.

TEXTBOOKS:

1. C. P. Arora. , Refrigeration and air conditioning - TMH, 2nd Edition, 2000.
2. R. Dossat, Principles of Refrigeration - - Pearson 4th Edition 2001
3. Refrigeration and Air conditioning / SC Arora &Domkundwar / Dhanpatrai

REFERENCE BOOKS:

1. S. C. Arora, Domkundwar, A course in refrigeration and air conditioning-Dhanapat Rai& sons 5th Edition ,1997.
2. Manohar Prasad, Refrigeration and Air conditioning, New Age international, 2003
3.Basic Refrigeration and Air-Conditioning / Ananthanarayanan / TMH

E-RESOURCES:

https://researchguides.austincc.edu/c.php?g=434739&p=5832566
http://ecoursesonline.iasri.res.in/course/view.php?id=445

IV B. Tech I Semester

Course Code:

JET AND ROCKET PROPULSION ENGINEERING

(Professional Elective – IV)

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Thermodynamics & IC Engine and Gas Turbine.

Course Objectives:

1. To provide an insight of fundamentals and salient features of Gas Turbine .
2. To impart the basic of jet Propulsion and jet engines.
3. To enable the students the concepts of Turbo Propulsion and Turbo jet.
4. To imbibe the knowledge of jet Propulsion and Rocket Propulsion system.
5. To enable the students learn basics of Rocket engine.
6. To impart the knowledge of Rocket Technology for Rocket engine.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Illustrate the thermodynamic aspects of gas turbines
CO2	Analyze the performance of jet engines
CO3	Compare different aspects of thermal jet engines
CO4	Summarize the working of rocket engines
CO5	Apply thrust mechanics to determine forces in rockets
CO6	Contrast the aspects of electrical, nuclear and plasma arc propulsions

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2									
CO2		3	2				2					
CO3	2	2					3					
CO4	3	2	1				2					
CO5		3	2									
CO6	3	1	1				1					

UNIT I

Introduction to Jet Propulsion

Elements of Gas Turbine theory – Thermodynamic cycles, open closed and semi-closed – Parameters of performance – Refinements simple cycle.

Jet Propulsion

Historical sketch – Reaction Principle – Essential features of propulsion devices – Thermal Jet Engines, Classification of – Energy flow, thrust, thrust power and propulsion efficiency – Need for Thermal jet engines and applications.

UNIT II

Turbo Propulsion and Turbojets

Thermodynamic cycles, Plant layout, essential components, principles of operation – performance evaluation – thrust Augmentation and Thrust reversal – Contrasting with Piston Engine Propeller Plant. Ramjet – Thermodynamic Cycle, Plant layout, essential components – Principle of operation – Performance evaluation- Comparison among atmospheric thermal jet engines – Square jet and Pulse jet, Elementary treatment of jet, Applications of Turbojets

UNIT III

Rocket Engines

Need - applications – Basic principle of operation and parameters of performance – Classification, solid and liquid propellant rocket engines, advantages, domains of application – Propellants – Comparison of propulsion systems.

UNIT IV

Rocket Technology

Flight mechanics, application Thrust Profiles, Acceleration – stating of Rockets, need for Feed systems, injectors and expansion nozzles – Rocket heat transfer and ablative cooling- Testing & Instrumentation – Advances Propulsion Systems, Elementary treatment of Electrical, Nuclear and Plasma Arc Propulsion.

TEXTBOOKS:

1. Gill Smith and Zierys, Fundamentals of I.C Engines, Revised Edition, Oxford &Ibh Publishing Co.Calcutta, 3rd Edition, 2007

2. Sutton, Rocket Propulsion, John Wiley & Sons, 8th Edition, 2010

3. Cohen, Rogers and Saravana Muto Gas Turbines, Prentice Hall, 6th Edition, 2008

4. V Ganesan, Gas Turbines, Tata McGraw-Hill Education, 3rd Education, 2010

REFERENCE BOOKS:

1. Hill and Paterson, Thermodynamics of Propulsion, Prentice Hall, 2nd Edition, 1991

E-RESOURCES:

https://www.sciencedirect.com/topics/engineering/jet-propulsion

https://nptel.ac.in/courses/101/104/101104019/

Lab code

ICS metrology ICS metrology lab

Practice:	3	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites: Machine Design, Engineering Physics

Course Objectives:

Course Objectives: The student can learn

1.Calibration of pressure gauge, temperature measuring instruments

2.Calibration of displacement, speed measuring instruments

3.Calibration of vibration measuring instruments

4.Measuring and gauging instruments for inspection of precision linear, geometric forms, angular and surface finish measurements.

5.The machine tool alignment test on lathe, milling and drilling machines

6.Operating tool maker's microscope and surface roughness measuring instrument.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1	Explain the calibration of pressure gauge, temperature measuring instruments
CO2	Demonstrate the calibration of displacement, speed measuring instruments
CO3	Explain the calibration of vibration measuring instruments
CO4	Explain the working of various instruments like vernier calipers, bevel protractor ,micrometers and dial indicators
CO5	Familiarize the working of tool maker's microscope and surface roughness measuring instruments.
CO6	Demonstrate the Machine tool alignment test on the lathe, drilling and milling machines

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	1							1		
CO2	3	3	2									

CO3	3	1	3								
CO4	2	3	2						1		
CO5	1	3	2						1		
CO6	2	3	2						1		

List of Experiments:

INSTRUMENTATION LAB

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature, thermocouple and resistance temperature detector measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of capacitive transducer.
6. Study and calibration of photo and magnetic speed pickups.
7. Study and calibration of a rotameter.
8. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
9. Study and calibration of Mcleod gauge for low pressure.

METROLOGY LAB

1. Measurement of bore by internal micrometres and dial bore indicator / rollers and slip gauges.
2. Use of gear teeth vernier calipers for checking the chordal addendum and chordal thickness of spur gear.
3. Alignment test on the lathe/milling machine using dial indicators.
4. Measurement of linear and angular dimensions using Tool makers microscope.
5. Angle and taper measurements by Bevel protractor, Sine bars, spirit level etc.
6. Measurement of effective diameter of a thread using Two wire/ Three wire method.
7. Surface roughness measurement by Talysurf instrument.

EQUIPMENT REQUIRED:

pressure gauge, Thermocouple, LVDT transducer ,Rotameter, Mcleod gauge, Strain gauge, Micrometres, Slip gauges, Gear teeth vernier calipers,

Lathe/Milling machine, Bevel protractor, Sine bars, Spirit level , Talysurf instrument.
REFERENCE BOOKS:
1. Engineering Metrology by KL Narayana, Scitech publishers. 2. Engineering Metrology and Measurements by NV Raghavendra, LKrishna Murthy, Oxford publishers 3.Precision Engineering in Manufacturing by R.L.Murthy / New Age.
E-RESOURCES:
https://www.npl.co.uk/resources **https://iopscience.iop.org/journal/0957-0233**

Lab code-

COMPUTATIONAL FLUID DYNAMICS LABORATORY

Practice:	3	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites:

Basic courses of Fluid Mechanics, Heat transfer and Numerical methods are required as prerequisites

Knowledge of matrices, differentiation, integration and differential equations is expected

Course Objectives:

1. Solving Problems of fluid mechanics and heat transfer by writing programs in MATLAB.
2. Using ANSYS-FLUENT build a geometry, mesh that geometry, Perform CFD method on the mesh, perform the calculation and post-process the results.
3. Understanding the validation of the numerical result by comparison with known analytical results.
4. Understanding the numerical result by invoking the physical principles of fluid mechanics and heat transfer
5. Illustrate the working concepts of thermal engineering
6. Solve mechanical engineering problems

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1	Identify, model, analyze and solve mechanical engineering problems
CO2	Understand basic knowledge of computational methods in Fluid flow applications.
CO3	Alalyze Initial Boundary value problems and determine various quantities of interest.
CO4	Use modern modeling and simulation tools and techniques
CO5	Develop practical solutions for mechanical engineering problems under professional and ethical constraints
CO6	Design and conduct laboratory experiments for thermal, fluids and mechanical systems

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2- Medium, 3 – High)												
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1		3	1	2	3	1	2					1
CO2	2		2		2		2					2
CO3	2	1		1		2						2
CO4	2	1	2	2	1	2	2					2
CO5	2	3	3	2	3	3	2					3
CO6	3	3	3	3	3	3	3					3

List of Experiments:

PART-A

Writing Programs in MATLAB for the following

1. Solution of Transcendental equations
2. Solution of Simultaneous algebraic equations
3. Numerical differentiation and Integration
4. Solution of Ordinary Differential Equation
5. Solution of a Tri-diagonal matrix using Thomas Algorithm.
6. Solution of Partial differential equations related to
   i) Elliptical Partial differential equations
   ii) Parabolic Partial differential equations
   iii) Hyperbolic Partial differential equations
7. Solution of 1-D and 2-D heat conduction with (Finite Difference method)
   i) Constant temperature boundary conditions
   ii) Constant heat flux boundary conditions
   iii) Convective boundary conditions
8. Solution of Incompressible Navier-Stokes equations (Finite difference and Finite Volume methods)
9. Solution of Inviscid incompressible fluid flows. (Finite difference and Finite Volume methods)

PART-B

Using ANSYS-FLUENT solve the following heat transfer analysis problems

1. steady state conduction

2. Lumped heat transfer

3. Convective heat transfer – Internal flow (study both velocity and thermal boundary layers)

4. Convective heat transfer – External flow (study both velocity and thermal boundary layers)

5. Radiation heat transfer– Emissivity

EQUIPMENT REQUIRED:

SOFTWARE REQUIRED

1. MATLAB R2009b and above.
2. Windows 7 and above.
3. Ansys 14 and above

REFERENCE BOOKS:

1. Computational Fluid Dynamics by Anderson JD
2. Introduction to Computational Fluid Dynamics by Atul Sharma

E-RESOURCES:

https://onlinecourses.nptel.ac.in/noc22_me02/preview

https://books.google.co.in/books/about/An_Introduction_to_Computational_Fluid_D.html?id=RvBZ-UMpGzIC

IV B. Tech II Semester

Course Code:
NANOTECHNOLOGY
(Professional Elective – V)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Physics, Chemistry, Biology, and Mathematics

Course Objectives:

1. Students will know about band structure, history, and applications of nanotechnology.
2. Students will know about the properties of different materials and their behaviour at nanoscale.
3. Students will know about characterization techniques and tools used at the nanoscale.
4. Students will know about the synthesis and fabrication of materials at nanoscale.
5. Students will know about applications of silicon carbide, alumina, and zirconia.
6. Students will know about the applications of nanomaterials in various fields.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain solids and their band structure and applications of nanotechnology.
CO2	Demonstrate about properties of materials and their behaviour at nanoscale.
CO3	Outline different characterization techniques and tools used at the nanoscale.
CO4	Summarize about synthesis and fabrication of materials at nanoscale.
CO5	Explain about applications of silicon carbide, alumina, and zirconia.
CO6	Outline the applications of nanomaterials in various fields.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	2						1			
CO2	3	2	1							1		
CO3	3	2	1									1
CO4	3	1	2								1	
CO5	3	1	2							1		
CO6	3	2	1									1

UNIT I

INTRODUCTION: Basics of Quantum Mechanics, Band Structure in Solids, History, and Scope, Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature the best of nanotechnologist, Challenges, and Future Prospects, Carbon Nano Technology.

PROPERTIES OF MATERIALS:

Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, optoelectronic properties. Effect of size reduction on properties, electronic structure of nanomaterials.

UNIT II

CHARACTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, Small Angle X-ray scattering (SAXS), scanning electron microscopy, Scanning Tunneling Microscope (STM), scanning probe microscopy, transmission electron microscopy, atomic force microscopy, piezo response microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle-resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy., Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT III

SYNTHESIS AND FABRICATION: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for nanoparticle preparation Bottom-Up Approach Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self-assembly, hydrothermal growth, thin-film growth, Top-Down Approach Ball milling, microfabrication, lithography. Consolidation of Nano powders: Shock wave consolidation, Hot isostatic pressing, and Coldisostatic pressing Spark plasma sintering.

UNIT IV

SILICON CARBIDE: Application of Silicon carbide, Sintering of SiC, sintering of nanoparticles, nanoparticles of alumina and zirconia, wear materials and nanocomposites,

APPLICATIONS OF NANOMATERIALS: Nano-electronics, Micro and Nano-electromechanical systems (MEMS/NEMS), Nano sensors, Nano catalysts, Food, and Agricultural Industries, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water Treatment, and the environment, Nano-medical applications, Nanobiology and a New Methodology in medical diagnostics, Nanomedicine Protocols for nano-drug Administration, Textiles, Paints, Energy, Defense and Space Applications, Nanotribology, Concerns, and challenges of Nanotechnology.

TEXTBOOKS:

1. Nanoscience and nanotechnology by M.S Ramachandra Rao, Shubra Singh, Wiley publishers.
2. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
3. Nano Essentials- T.Pradeep/TMH
4.Textbook of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, BaldevRaj, B.B. Rath, and James Munday, University Press-IIM.

REFERENCE BOOKS:

1. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wiley India Edition, 2012.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell
4. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University Press.

E-RESOURCES:

https://www.hsls.pitt.edu/e-journals/Nanotechnology
https://www.nature.com/nnano/

IV B. Tech II Semester

Course code-

INTRODUCTION TO ROBOTICS

(Professional Elective – V)

Lecture – Tutorial:	2-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of Engineering Mathematics, Engineering Mechanics

Course Objectives:

1. Student will know the fundamental concepts of industrial robotic technology.
2. Student will be exposed to the various types of end effectors.
3. Student will apply the basic mathematics to calculate kinematic forces in robot manipulator.
4. Student will understand the robot controlling and programming methods.
5. Student will be in a position to describe various actuators, sensors.
6. Student will be aware of the various industrial applications of robots.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Identify various robot configurations.
CO2	Understand the basic components of robots.
CO3	Evaluate D-H notations for simple robot manipulator.
CO4	Perform trajectory planning for a manipulator by avoiding obstacles.
CO5	Select appropriate actuators and sensors for a robot.
CO6	Illustrate the industrial applications of robots.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3					1					2	
CO2	2		3								1	
CO3		3	2		1							
CO4		2	3									1
CO5	2	-	-	-	3						1	
CO6	2				3						1	

UNIT I

Introduction: Automation and robotics, Robot anatomy, robot motions, Joint notation schemes, work volume, speed of motions, load carrying capacity, Speed of response & stability, Precision of movement- Spatial resolution, accuracy, repeatability, compliance. Classification of robots by coordinate system and control system.

Components of the Industrial Robotics: Function line diagram representation of robot components, number of degrees of freedom, Types of end effectors, Mechanical grippers, gripper mechanisms, other types of grippers, Considerations in gripper selection and design.

UNIT II

Motion Analysis: Transformation matrices- Translation, Rotation, Combined translation and rotation, Homogeneous transformation matrix - Problems.

Manipulator Kinematics: Description of Link and Joint parameters, Kinematic modelling of the manipulator, D-H Notation, Kinematic relationship between adjacent links, Forward and Inverse kinematics. Differential kinematics

UNIT III

Trajectory Planning: Terminology, Steps in trajectory planning, Slew motion, joint integrated motion, straight line motion, circular motion, Joint space technique, Cartesian space technique, cubic polynomial with and without via points.

Robot Programming and Languages: Lead through programming, robot program as a path in space, WAIT, SIGNAL, DELAY commands, Branching, capabilities and limitations. Textual robot languages, generations, Language structure, Elements and functions.

Dynamics: Differential transformation and manipulators, Jacobians – problems Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

UNIT IV

Robotic Actuators and Sensors: Pneumatic, Hydraulic actuators, electric & stepper motors, Internal &external sensors, Position, Velocity sensors, Tactile, Proximity and Range sensors.

Robot Applications in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection

TEXTBOOKS:

1. Mikell P. Groover and Mitchell Weiss, Roger N. Nagel,NicholasG.Odrey , Industrial Robotics — Mc Graw Hill, 1986.
2. R K Mittal and I J Nagrath, Robotics and control, Illustrated Edition, Tata McGraw Hill India 2003.

REFERENCE BOOKS:

1. Saeed B. Niku, Introduction to Robotics – Analysis, System, Applications, 2nd Edition, John Wiley & Sons, 2010.
2. H. Asada and J.J.E. Slotine, Robot Analysis and Control, 1st Edition Wiley-Interscience, 1986.
3. Robert J. Schillin, Fundamentals of Robotics: Analysis and control, Prentice-Hall Of India Pvt. Limited, 1996.
4. Mohsen shahinpoor, A robot Engineering textbook, Harper & Row Publishers,1987.
5. John.J.Craig Addison, Introduction to Robotics: Mechanics and Control, Wesley, 1999.
6. K.S. FU, R.C. Gonzalez and C.S.G Lee, Robotics: Control, sensing, vision, and intelligence. Mc Graw Hill, 1987.
7. Richard D. Klafter, Thomas Robotic Engineering an integrated approach, PHI publications 1988.

E-RESOURCES:

https://ocw.mit.edu/courses/mechanical-engineering/2-12-introduction-to-robotics-fall-2005/

https://onlinecourses.nptel.ac.in/noc21_de13/preview

IV B. Tech II Semester

Course Code:

ENERGY CONSERVATION AND MANAGEMENT

(Professional Elective – V)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Environment Studies, Elements of Mechanical Engineering, Thermodynamics

Course Objectives:

1. Student will understand about Energy conservation and role of Energy Management.
2. Student will understand about Energy conservation in Electrical systems.
3. Student will understand about Energy conservation in Thermal systems.
4. Student will understand bout Principles of Energy Management, Energy demand estimation and applications of life cycle costing analysis.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Student should be able to know basics of Energy conservation and Environmental Aspects Associated With Energy Utilization
CO2	Student should be able to know basics of Energy Management.
CO3	Students should be able to Evaluate the energy saving & conservation in different Energy conservation in Electrical systems.
CO4	Students should be able to Evaluate the energy saving & conservation in different Energy conservation in Thermal systems.
CO5	Students should be able to prepare Energy demand estimation, Organizing and Managing Energy Management Programs.
CO6	Students should be able to Economic Aspects Calculation of simple payback method and Applications of life cycle costing analysis

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3			1		1					2	
CO2	2		3					1			1	
CO3		3	2		1					1		
CO4		2	3	3			1					1
CO5	3			2				1			1	
CO6	2			3						1		

UNIT I

Introduction: Energy – Power – Past & Present Scenario Of World; National Energy Consumption Data – Environmental Aspects Associated With Energy Utilization – Energy Auditing: Need, Types, Methodology And Barriers. Role Of Energy Managers. Instruments For Energy Auditing.Basic Principles of Energy Audit and management Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential.

UNIT II

Electrical Systems: Lighting Modification of existing systems – Replacement of existing systems – Luminous efficiency-Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings-Electric Motors – Motor Efficiency Computation, Energy Efficient Motors,Energy conservation measures.

UNIT III

Thermal Systems: Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters, Space Heating and Ventilation – Air–Conditioning (HVAC) and Water Heating – Efficiency Computation and Encon Measures. Steam: Distribution & Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT IV

Energy Management: Principles of Energy Management, Energy demand estimation, Organizing and Managing Energy Management Programs, Energy pricing.Computation of Economic Aspects Calculation of simple payback method – Net present worth method – Power factor correction –Applications of life cycle costing analysis – Return on investment.

TEXTBOOKS:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995.

REFERENCE BOOKS:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation by v Sharma and p venkataseshaiah International Publishing House pvt.ltd,2011.

E-RESOURCES:

https://www.electricalindia.in/energy-management-and-conservation/

https://www.springer.com/journal/12053

IV B. Tech II Semester

Course Code:

COMPUTER GRAPHICS AND GEOMETRICAL MODELING

(Professional Elective – V)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Engineering Drawing, Engineering mathematics, CAD

Course Objectives:

1. Student will understand about Energy conservation and role of Energy Management.
2. Student will understand about Energy conservation in Electrical systems.
3. Student will understand about Energy conservation in Thermal systems.
4. Student will understand bout Principles of Energy Management, Energy demand estimation and applications of life cycle costing analysis.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Student should be able to know basics of Energy conservation and Environmental Aspects Associated with Energy Utilization
CO2	Student should be able to know basics of Energy Management.
CO3	Students should be able to Evaluate the energy saving & conservation in different Energy conservation in Electrical systems.
CO4	Students should be able to Evaluate the energy saving & conservation in different Energy conservation in Thermal systems.
CO5	Students should be able to prepare Energy demand estimation, Organizing and Managing Energy Management Programs.
CO6	Students should be able to Economic Aspects Calculation of simple payback method and Applications of life cycle costing analysis

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3			1		1					2	
CO2	2		3					1			1	
CO3		3	2		1					1		
CO4		2	3	3			1					1
CO5	3			2				1			1	
CO6	2			3						1		

UNIT I

CAD Tools: Definition of CAD Tools, Graphics standards, Graphics software: requirements of graphics software, Functional areas of CAD, Efficient use of CAD software. Basics of Geometric Modelling: Requirement of geometric modelling, Geometric models, Geometric construction methods, Modelling facilities desired.

UNIT II

Geometric modelling: Classification of wireframe entities, Curve representation methods, Parametric representation of analytic curves: line, circle, arc, conics, Parametric representation of synthetic curves: Hermite cubic curve, Bezier curve, B-Spline curve, NURBS, Curve manipulations.

UNIT III

Solid Modelling: Geometry and topology, Boundary representation, The Euler-Poincare formula, Euler operators, Constructive solid geometry: CSG primitives, Boolean operators, CSG expressions, Interior, Exterior, closure, Sweeping: linear and non-linear, Solid manipulations

UNIT IV

Transformations: 2-D and 3-D transformations: translation, scaling, rotation, reflection, concatenation, homogeneous coordinates, Perspective projection, orthotropic projection, isometric projection, Hidden surface removal, shading, rendering. CAD/ CAM Data Exchange: Evaluation of data exchange format, Data exchange formats: IGES, PDES, CGM, STEP Dimensioning and tolerances: Linear, angular, angular dimensions, maximum material condition (MMC), Least material condition (LMC), Regardless of feature size (RFS).

TEXTBOOKS:

1. CAD/CAM Concepts and Applications/ Alavala/ PHI.
2. Mastering CAD/CAM / Ibrhim Zeid / Mc Graw Hill International.
3. CAD/CAM Principles and Applications/ P.N.Rao/TMH/3rd Edition
4. CAD/CAM /Groover M.P./ Pearson education

REFERENCE BOOKS:

1. CAD / CAM / CIM, Radhakrishnan and Subramanian/ New Age
2. Principles of Computer Aided Design and Manufacturing/ Farid Amirouche/ Pearson
3. Computer Numerical Control Concepts and programming/ Warren S Seames/ Thomson.

E-RESOURCES:

https://www.cs.princeton.edu/courses/archive/spr00/cs598b/

IV B. Tech II Semester

Course Code:

DESIGN FOR MANUFACTURING

(Professional Elective-VI)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Manufacturing Process, Engineering Materials, Design of Machine Elements- I, II

Course Objectives:

1. Student will know the the basic concept of DFMA for economical production
2. Student will be exposed to the proper materials for design considerations.
3. Student will apply understand the field of metal casting.
4. Student will understand the machining and forming considerations in Design for Manufacturing..
5. Student will be in a position of joining and integrate the knowledge of compliance analysis
6. Student will be aware of design considerations in interference analysis for assembly..

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concept of DFMA for economical production
CO2	Identify and select the proper materials.
CO3	Apply the knowledge in the field of metal casting.
CO4	Select the machining and forming considerations in Design for Manufacturing.
CO5	Apply the design considerations in joining and integrate the knowledge of compliance analysis
CO6	Apply the design considerations in interference analysis for assembly.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3					1					2	
CO2	2		3								1	
CO3		3	2		1							
CO4		2	3									1
CO5	2	-	-	-	3						1	
CO6	2				3						1	

UNIT I

Introduction to DFMA: History of DFMA, Steps for applying DFMA during product design, Advantages of applying DFMA during product design, Reasons for not implementing DFMA,

Introduction to Manufacturing Process: Classification of manufacturing process, Basic manufacturing processes, Mechanical properties of material: Tensile properties, engineering stress-strain, True stress strain, Compression properties, Shear properties Introduction to materials and material selection: Classification of engineering

materials, Material selection for product design.

UNIT II

DFM methodology for Sand casting: Typical characteristics of sand cast part, Design Recommendation for sand casting, Die casting: Suitable material consideration, General design consideration, Specific design Recommendation. Powder metal processing: Typical characteristics, Design recommendations

UNIT III

DFM methodology for Machining: Recommended materials for machinability, Design Recommendations, Turning operation: Suitable materials, Design Recommendations,
DFM methodology for Forging: Forging processes, Forging nomenclature, Suitable materials for forging, Design Recommendations, Extrusion: Process, Suitable material for extrusion, Design Recommendation for metal extrusion. Rolled Section: Process, Design Recommendations of rolled section,

UNIT IV

DFM methodology for Welding: Review of welding Processes, design recommendation for welding process, Solder and brazed assembly: Process, Typical characteristics, Suitable materials, Design detail recommendations, adhesively bonded assemblies: Typical characteristics, Suitable materials, Design Recommendations for adhesive joint Assembly: Compliance analysis and interference analysis for the design of assembly – design and development of features for automatic assembly –liaison diagrams. Environment: Motivations for environment, principles of environment-eco-efficiency, product life cycle perspective, environment tools and processes, environment design guidelines.

TEXTBOOKS:

1. L. C. Schmidt, G. Dieter, Engineering Design, 4thedition, McGraw Hill Education India Private Limited.
2. James G. Bralla, Hand Book of Product Design for Manufacturing, McGraw Hill Co., 2nd edition1986.
3. Robert Matousek., Engineering Design - A Systematic Approach, Blackie & Sons Ltd, 1963.
4. P.Dewhurst, W.Knight, G.Boothroyd, Product Design for Manufacture and Assembly, CRC Press.

REFERENCE BOOKS:

1. A K Chitale and R C Gupta, "Product Design and Manufacturing", PHI, New Delhi,
2. J. Lesko, Industrial Design, Materials and Manufacture Guide, John Willy and Sons, Inc
3. O. Molloy, S. Tilley and E.A. Warman Design for Manufacturing and assembly, Chapman &Hall, London, UK.
4. D. E. Whitney, Mechanical Assemblies: Their Design, Manufacture, and Role in Product Development, Oxford University Press, New York

E-RESOURCES:

https://news.ewmfg.com/blog/manufacturing/dfm-design-for-manufacturing
https://www.plm.automation.siemens.com/global/en/our-story/glossary/design-for-manufacturing-and-assembly-dfma/53982

IV B. Tech II Semester

Course Code:

AUTOMOBILE ENGINEERING

(Professional Elective-VI)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Thermodynamics, Machine Design, Metallurgy

Course Objectives:

1. Students will know about the basic layout of an automobile.
2. Students will know about the operation of engine cooling and lubrication systems.
3. Students will know about the operation of ignition, electrical, and air conditioning systems.
4. Students will know about the principles of transmission and steering systems.
5. Students will know about the principles of suspension and braking systems.
6. Students will know about emissions from automobiles and energy alternatives.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the basic layout of an automobile and the fuel systems used.
CO2	Demonstrate the operation of cooling and lubrication systems in automobiles.
CO3	Outline the operation of ignition, electrical, and air conditioning systems in automobiles.
CO4	Summarize the operation of transmission and steering systems.
CO5	Explain the operation of suspension and braking systems.
CO6	Outline the emissions from automobiles and energy alternatives.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	1					1				
CO2	3	1	2						1			
CO3	3	2	1						1			
CO4	2	3	1							1		
CO5	2	3	1								1	
CO6	3	2	1									

UNIT I

INTRODUCTION: Components of four-wheeler automobile chassis and body power unit, power transmission, rear-wheel drive, front-wheel drive, four-wheel drive types of automobile engines, engine construction engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps, crankcase ventilation, engine service, reboring, decarburization, Nitriding of the crank shaft.

FUEL SYSTEM:

S.I. ENGINE: Fuel supply systems, Mechanical and electrical fuel pumps, carburetor

types, air filters, petrol injection.

C.I. ENGINES: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobile injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel pumps.

UNIT II

COOLING SYSTEM: Cooling Requirements, Air Cooling, Liquid Cooling, and Forced Circulation System, Radiators, Types Cooling Fans, water pumps, thermostat, evaporating cooling pressure sealed cooling antifreeze solutions.

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage battery, autotransformer, contact breaker points, condenser and spark plug Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers spark advance and retard mechanism.

ELECTRICAL SYSTEM: Charging circuit, generator, current-voltage regulator starting system, Bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator, etc.

UNIT III

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single-plate clutch, multi-plate clutch, magnetic and centrifugal clutches, fluid flywheel, Gearboxes, types, sliding mesh, construct mesh, synchromesh gearboxes, epicyclic gearbox, overdrive torque converter. Propeller shaft Hotch Kiss drive, Torque tube drive universal joint, differential rear axles, types of wheels, and tires.

STEERING SYSTEM: Steering geometry camber, castor, kingpin rake, combined angle toe in, center point steering. Types of steering mechanism Ackerman steering mechanism, Davis steering mechanism, steering gear types, steering linkages.

SUSPENSION SYSTEM: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

UNIT IV

BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

ENGINE SERVICE: Introduction, service details of the engine cylinder head, valves, valve mechanism, piston connecting rod assembly, cylinder block, crankshaft, main bearings, engine reassembly precautions.

EMISSIONS FROM AUTOMOBILES: Pollution standards National and international Pollution Control Techniques, Energy alternatives: Solar, Photovoltaic, Hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels, and gaseous fuels, Hydrogen as a fuel for IC Engines. Their merits and demerits. Standard Vehicle maintenance practice.

TEXTBOOKS:

1.Automobile Engineering by Kripal Singh Vol. 1 & Vol. 2.
2.Automobile Engineering by K.M Gupta, Umesh publication, Vol. 1 & Vol. 2.
3.Automobile Engineering / William Crouse/TMH Distributors.
4.Automobile Engineering/P. S Gill/S.K. Kataria& Sons/New Delhi.

REFERENCE BOOKS:

1. A Textbook of Automobile Engineering by R K Rajput. Laxmi Publications.

2. A Textbook of Automobile Engineering By Khalil U Siddiqui New Age International.
3. Automobile Engineering / C Srinivasan/McGraw-Hill.
4. Alternative fuels of Automobiles by P.Rami Reddy, Frontline publications.

E-RESOURCES:

https://journals.sagepub.com/home/pid
https://hud.libguides.com/mechanical_automotive

IV B. Tech II Semester

Course Code:

METAL FORMING PROCESS

(Professional Elective – VI)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fundamentals of formability of materials and different metal forming processes and its applications.

To impart knowledge on various aspects of metal forming and to develop the skill to analyses under different conditions.

Course Objectives:

1. Student will know the various fundamental concepts of metal forming process
2. Student will be understand the various process parameters and applied loads in forging.
3. Student will be exposed to the various process parameters in sheet metal working.
4. Student will be understand Rolling and Extrusion processes and associated parameters
5. Student will be understand the various methods to Drawing processes
6. Student will beaware of various High Energy Rate forming processes.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the fundamental concepts of metal forming.
CO2	Know the various process parameters and applied loads in forging.
CO3	Know the various process parameters and applied loads in sheet metal working.
CO4	Analyze Rolling and Extrusion processes and associated parameters
CO5	Analyze Drawing.
CO6	Analyze various High Energy Rate forming processes.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2		2		3							
CO2	2		2		3							
CO3	2		2		3							
CO4	2		3		3							
CO5	2		2		3							
CO6	2		2		3							

UNIT I

Fundamentals of Metal Forming: Classification of forming processes- classification, mechanisms of metal forming: slab method, Upper and lower bound analysis, Deformation energy method, temperature of metal working, hot working, Warm working, cold working friction and lubricants. Formability limits, Strain rates in metal

forming Development of metallurgical structure during deformation Flow curves Plastic stressstrain relationship - plastic work - the principle of normality -incremental plastic strain. Strain rate - super plasticity

UNIT II

Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closeddie forging, forging defects, and powder metallurgy forging. Problems on flow stress, true strain and forging load.

Press tool design: Design of various press tools and dies like piercing dies, blanking dies, compound dies and progressive dies, blanking, punching, problems on Blanking and punching force, clearances, Elastic recovery and shear.

Sheet metal forming: Forming methods, bending, stretch forming, Spinning.

UNIT III

Rolling: Rolling processes, forces and geometrical relationship in rolling, simplified analysis, rolling load, rolling variables, theories of cold and hot rolling, problems and defects in rolling, torque and power calculations, Problems.

Extrusion: Classification, Hot Extrusion, Analysis of Extrusion process, defects in extrusion, extrusion of tubes and production of seamless pipes. Problems on extrusion load.

UNIT IV

Drawing: Drawing of tubes, rods, and wires: Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing. Problems on draw force. Cup drawing

Advanced Metal forming processes: Electromagnetic forming. Explosive Forming, Electrohydraulic forming.

Miscellaneous Forming Processes: Coining, Thread Rolling, Tube piercing,

TEXTBOOKS:

1. Manufacturing Science- Amitabha Ghosh , Ashok Kumar Mallik, EWP
2. Fundamentals of Metal Forming Processes – B.L. Juneja
3. Mechanical Metallurgy by G. E. Dieter, McGraw-Hill.

REFERENCE BOOKS:

1. Metal Forming: Fundamentals and Applications by TaylanAltan (ASM Series in Metal Processing)
2. Introduction to Industrial Mechanical Working Process by G. W. Rowe
3. Manufacturing Technology (Foundry, Forming and Welding) by P. N. Rao, TMH
4. Materials & Processes In Manufacturing By E.Paul De Germo, J T Black & Ronald A Koshav
5. Modern Control Engineering by Ogata, PHI Publ. Prentice-Hall of India Pvt. Ltd.

E-RESOURCES:

https://www.sciencedirect.com/topics/materials-science/metal-forming-process
https://www.springer.com/journal/12289

IV B. Tech II Semester

Course Code:

PROJECT MANAGEMENT

(Professional Elective – VI)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. Student will know the types of projects and benefits of project management.
2. Student will understand the job role of a Project manager.
3. Student will be able to conduct the feasibility studies of any project.
4. Student will understand how to manage the project management activities.
5. Student will be able to plan for the completion of the project if the project time needs to be reduced.
6. Student will get the knowledge of risk management.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the significance of project management its objectives and various phases involved in project management life cycle.
CO2	Role and responsibilities of a Project Manager
CO3	Gain knowledge regarding project feasibility study and various Organizational issues.
CO4	Able to apply various tools like CPM & PERT in project management.
CO5	Understand how to speed up a project's timeline by adding additional resources.
CO6	Gain knowledge in risk management and role of IT in project management.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2											3
CO2	2											3
CO3	2											3
CO4	2											3
CO5	2											3
CO6	2											3

UNIT I

Basics of Project Management: Introduction, Evolution of project management, Objectives of project management, Types of projects, Types of project delays, Benefits of project Management, Stake holders of a project.

Project Management Life cycle: Phases of Project Management Life Cycle, Role of a Project Manager (PM).

UNIT II

Project Feasibility study: Introduction, Pre-Feasibility Study, Types of feasibility,

Steps of feasibility study.

Project Organizational Structures: Introduction, Concept of Organizational Structure, Essential qualities of a project manager, Organizational structure for projects, Project management offices.

UNIT III

Techniques of Project Management: Introduction, simple network techniques, construction rules of drawing, Fulkerson's rule, Critical path method (CPM)- floats, critical path, project duration, PERT: Introduction, different Time estimates, expected time, variance, expected project duration and probability of completion.

Crashing of Project network: Introduction, General guidelines for network crashing, Types of crashing, problems

UNIT IV

Project Risk Management and failure: Introduction, Types of Risk, Steps in Risk Management, Risk Assessment, Project failure-causes of project failure.

Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS.

TEXTBOOKS:

1. P. Panneerselvam, R. Senthil kumar, "Project Management" PHI 2009
2. Ramakrishna &Kamaraju "Essentials of Project Management" Kindle Edition PHI, 2010

REFERENCE BOOKS:

1. Harold Kerzner "Project Management- A system approach to planning, scheduling & Controlling" Eleventh Edition, wiley.
2. Thomas Erickson & P. V. Khatri "Project Management" Global Vision Publishing House (2015).

E-RESOURCES:

https://www.projectmanager.com/resources

NRI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution Permanently Affiliated to JNTUK, Kakinada)
(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

DEPARTMENT OF MECHANICAL ENGINEERING
STRUCTURE FOR SECOND YEAR B. TECH PROGRAMME
II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Fourier Transforms and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2103401	Mechanics of Solids	3	0	0	3	30	70	100	3
3	20A2103402	Fluid Mechanics & Hydraulic Machines	3	0	0	3	30	70	100	3
4	20A2103403	Production Technology	3	0	0	3	30	70	100	3
5	20A2103404	Kinematics of Machines	3	0	0	3	30	70	100	3
6	20A2103301	Thermodynamics	3	0	0	3	30	70	100	3
7	20A2103491	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	3	15	35	50	1.5
8	20A2103492	Production Technology Lab	0	0	3	3	15	35	50	1.5
9	20A2103991	Drafting and Modeling Lab	0	0	3	3	--	50	50	1.5
10	20A2100801	Constitution of India	2	0	0	2	30	70	100	0
Total			**20**	**0**	**9**	**29**	**240**	**610**	**850**	**22.5**

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2203301	Material Science & Metallurgy	3	0	0	3	30	70	100	3
2	20A2200201	Complex Variables and Statistical Methods	3	0	0	3	30	70	100	3
3	20A2203401	Dynamics of Machinery	3	0	0	3	30	70	100	3
4	20A2203402	Thermal Engineering-I	3	0	0	3	30	70	100	3
5	20A2200102	Industrial Engineering and Management	3	0	0	3	30	70	100	3
6	20A2203391	Mechanics of Solids and Metallurgy Lab	0	0	3	3	15	35	50	1.5
7	20A2203491	Machine Drawing Practice	0	0	3	3	15	35	50	1.5
8	20A2203492	Theory of Machines Lab	0	0	3	3	15	35	50	1.5
9	20A2203991	Python Programming Lab	0	0	3	3	--	50	50	1.5
10	20A2200801	Essence of Indian Traditional Knowledge	2	0	0	2	30	70	100	0
Total			**17**	**0**	**12**	**29**	**195**	**505**	**700**	**21**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

Mechanical Department
NRI Institute of Technology
POTHAVARAPPADU (VIII)
Agiripalli (Md), Krishna Dist.

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DEPARTMENT OF MECHANICAL ENGINEERING
STRUCTURE FOR SECOND YEAR B. TECH PROGRAMME
II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Fourier Transforms and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2103401	Mechanics of Solids	3	0	0	3	30	70	100	3
3	20A2103402	Fluid Mechanics & Hydraulic Machines	3	0	0	3	30	70	100	3
4	20A2103403	Production Technology	3	0	0	3	30	70	100	3
5	20A2103404	Kinematics of Machines	3	0	0	3	30	70	100	3
6	20A2103301	Thermodynamics	3	0	0	3	30	70	100	3
7	20A2103491	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	3	15	35	50	1.5
8	20A2103492	Production Technology Lab	0	0	3	3	15	35	50	1.5
9	20A2103991	Drafting and Modeling Lab	0	0	3	3	--	50	50	1.5
10	20A2100801	Constitution of India	2	0	0	2	30	70	100	0
Total			**20**	**0**	**9**	**29**	**240**	**610**	**850**	**22.5**

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2203301	Material Science & Metallurgy	3	0	0	3	30	70	100	3
2	20A2200201	Complex Variables and Statistical Methods	3	0	0	3	30	70	100	3
3	20A2203401	Dynamics of Machinery	3	0	0	3	30	70	100	3
4	20A2203402	Thermal Engineering-I	3	0	0	3	30	70	100	3
5	20A2200102	Industrial Engineering and Management	3	0	0	3	30	70	100	3
6	20A2203391	Mechanics of Solids and Metallurgy Lab	0	0	3	3	15	35	50	1.5
7	20A2203491	Machine Drawing Practice	0	0	3	3	15	35	50	1.5
8	20A2203492	Theory of Machines Lab	0	0	3	3	15	35	50	1.5
9	20A2203991	Python Programming Lab	0	0	3	3	--	50	50	1.5
10	20A2200801	Essence of Indian Traditional Knowledge	2	0	0	2	30	70	100	0
Total			**17**	**0**	**12**	**29**	**195**	**505**	**700**	**21**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

II B. Tech I Semester

20A2100201:Vector calculus, Transform Techniques and Partial Differential Equations

Lecture	3	**Internal Marks:**	30
Tutorial	1		
Credits	3	**External Marks:**	70

Course Objectives:

- Tofamiliarizethetechniques inpartialdifferential equations
- Tofurnishthe learnerswithbasicconcepts and techniques at plus two level to lead them into advanced level by handling various real-world application

CourseOutcomes:

Upon successful completion of the course, the student will be able to:

CO1	Interpret the physical meaning of different operators such as gradient, cur land divergence (L5)
CO2	Estimate the work done against a field, circulation and flux using vector calculus (L5)
CO3	Apply the Laplace transform for solving differential equations (L3)
CO4	Find or compute the Fourier series of periodic signals (L3)
CO5	Knowandbe able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3)
CO6	Identify solution methods for partial differential equations that model physical processes (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

UNIT I

Vector calculus:

Vector Differentiation: Gradient –Directional derivative–Divergence–Curl–Scalar Potential.

Vector Integration: Line integral–Work done–Area–Surface and volume integrals.

Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)

UNIT II

Laplace Transforms:
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Inverse Laplace transforms– Convolution theorem (without proof).
Applications:
Solving ordinary differential equations (initial value problems) using Laplace transforms

UNIT III

Fourier series and Fourier Transforms:
Fourier Series:
Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.
Fourier Transforms:
Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosine transforms –inverse trans forms –Finite Fourier transforms

UNIT IV

PDE of first order:
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT V

Second order PDE:
Second order PDE: Solutions of linearpartial differential equations with constantcoefficient –RHS term of the typee^{ax+by}, $sin(ax+by)$, $cos(ax+by)$, $x^m y^n$. Method of separation of variables – introduction.

TEXT BOOKS:
1B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

REFERENCE BOOKS:
1. ErwinKreyszig, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.
3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.
4. Srimantha Pal, SCBhunia, Engineering Mathematics, Oxford University Press

E-RESOURCES:
1.www.nptelvideos.com/mathematics/ (Math Lectures from MIT, Stanford,IIT'S)
2.nptel.ac.in/courses/122104017
3.nptel.ac.in/courses/111105035

II B. Tech I Semester

20A2103401: MECHANICS OF SOLIDS

Lecture Tutorial:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Engineering Mechanics, Introduction to Mechanical Engineering Sciences.

Course Objectives: The student will be able

1.	Gain a fundamental understanding of the concepts of stress and strain by analysing different solids and structures
2.	Analyze and beams, to determine axial forces, torque, shear forces, and bending moments
3.	Analyze the beams of different shapes for finding out the shear stress and bending stress distribution.
4.	Develop the governing differential equation for the elastic curve and apply different techniques for finding out the deflection at required points.
5.	Analyze determinate and indeterminate axial members, torsional members
6.	Calculate the buckling load for columns with different end conditions.

Course Outcomes:

Upon successful completion of the course, the students will develop ability:

CO1	Model & analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium.
CO2	Understand the apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads.
CO3	Students will learn all the methods to analyze beams, columns, frames for normal, shear, and torsion stresses and to solve deflection problems in preparation for the design of such structural components.
CO4	Students are able to analyse beams and draw correct and complete shear and bending moment diagrams for beams.
CO5	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior
CO6	Design and analysis of Industrial components like pressure vessels.

Contribution of Course Outcomes towards the achievement of Program Outcomes (1 Low, 2 Medium, 3 High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	3	-	-	-	-	-	-	-	-	1
CO2	3	2	3	-	-	-	-	-	-	-	-	1
CO3	3	2	3	-	-	-	-	-	-	-	-	1
CO4	3	2	3	-	-	-	-	-	-	-	-	1
CO5	3	2	3	-	-	-	-	-	-	-	-	1
CO6	3	2	3	-	-	-	-	-	-	-	-	1

UNIT – I

SIMPLE STRESSES &STRAINS :Elasticity and plasticity – Types of stresses & strains– Hooke'slaw – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT II

SHEAR FORCE AND BENDING MOMENT: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of abeam.

UNIT III

FLEXURAL STRESSES : Theory of simple bending – Assumptions – Derivation of bending equation: M/ I = f/y = E/R Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.
SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T anglesections.

UNIT IV

DEFLECTION OF BEAMS : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams, Statically indeterminate Beams and solutionmethods.
TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel.

UNIT – V

THIN AND THICK CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells. Wire wound thin cylinders. Lame's equation – cylinders subjected to inside & outside pressures
–compoundcylinders.

COLUMNS: Buckling and Stability, Columns with Pinned ends, Columns with other support Conditions, Limitations of Euler's Formula, Rankine's Formula.

TEXTBOOKS

1. Strength of materials /GH Ryder/, Mc Millan publishers IndiaLtd.
2. Strength of materials by B.C. Punmia-lakshmi publications pvt.Ltd, NewDelhi.

REFERENCE BOOKS:

1. Strength of materials by R.K. Bansal
2. Strength of Materials by S.S. Rattan, Tata McGraw Hill Education Pvt., Ltd.,
3. Strength of materials by R.K. Rajput, S. Chand & Co, New Delhi
4. Strength of Materials -By Jindal, Umesh Publications.
5. Strength of Materials by S.Timoshenko
6. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman.

E-RESOURCES:

1. http://www.nptelvideos.in/2012/12/strength-of-materials.html

II B. Tech I Semester

20A2103402: FLUID MECHANICS & HYDRAULIC MACHINES

Lecture Tutorial:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:	
Fundamentals of Engineering Mechanics	
Course Objectives: The student will	
1	Student will know the concept of fluid and its properties, manometry, hydrostatic forces acting on different surfaces and also problem-solving techniques
2	Student will be exposed to the basic laws of fluids, flow patterns, viscous flow through Pipes and their corresponding problems.
3	Student will be aware of the concepts related to boundary layer theory and dimensional analysis.
4	Student will know the hydrodynamic forces acting on vanes and their performance evaluation
5	Student will be in a position to evaluate the performance characteristics of hydraulic turbines
6	Student will be aware of the importance, function and performance of hydro machinery

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Apply The basic concepts of fluid properties.
CO2	Apply The mechanics of fluids in static and dynamic conditions.
CO3	Apply Boundary layer theory, flow separation and dimensional analysis
CO4	Analyze Hydrodynamic forces of jet on vanes in different positions.
CO5	Analyse the impact of jet on the vanes
CO6	Evaluate performance of hydraulic machines and pumps

Contribution of Course Outcomes towards the achievement of Program Outcomes (1 Low, 2 Medium, 3 High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-

UNIT I

Fluid statics: Dimensions and units: physical properties of fluids - specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric, gauge and vacuum pressure, Measurement of pressure – Manometers - Piezometer, U-tube, inverted and differential manometers. Pascal's & hydrostatic laws.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortexflow

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream

line, momentum equation and its applications, force on pipebend.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes

in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT III

Boundary Layer Theory: Introduction, momentum integral equation, displacement, momentum and energy thickness, separation of boundary layer, control of flow separation, Stream lined body, Bluff body and its applications, basic concepts of velocity profiles.

Dimensional Analysis: Dimensions and Units, Dimensional Homogeneity, Non dimensionalization of equations, Method of repeating variables and Buckingham Pi Theorem

UNIT IV

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes

.**Hydraulic Turbines**: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design – draft tube- theory- functions and efficiency.

UNIT – V

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems- hydraulic ram, hydraulic lift, hydraulic coupling.

Centrifugal pumps: classification, working, work done – manometric head- losses and efficienciesspecific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Fluid Mechanics- Fundamentals and Applications by Y.A. Cengel, J.M.Cimbala, 6 thEdn,McGrawHill
2. Fluid Mechanics - Dixon, 7 thEdn,Elesvie

REFERENCE BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery- Modi andSeth
2. Fluid Mechanics and Hydraulic Machines - RK Bansal- Laxmi Publications (P)Ltd.
3. Fluid Mechanics and Hydraulic Machines –Rajput
4. Fluid Mechanics and Fluid Power Engineering - D.S. Kumar, Kotaria&Sons.
5. Fluid Mechanics and Machinery - D. Rama Durgaiah, New AgeInternational.

E-RESOURCES:

1. https://nptel.ac.in

II B. Tech I Semester

20A2103403: PRODUCTION TECHNOLOGY

Lecture – Tutorial:	**3 - 0 Hours**	**Internal Marks:**	**30**
Credits:	**3**	**External Marks:**	**70**

Prerequisites: Metallurgy and Material Science

Course Objectives:

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, bulk forming, sheet metal forming and powder metallurgy and their relevance in current manufacturing industry.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Able to design the patterns and core boxes for metal casting processes
CO2	Able to design the gating system for different metallic components
CO3	Know the different types of manufacturing processes
CO4	Be able to use forging, extrusion processes
CO5	Learn about the different types of welding processes used for special fabrication.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	2	-	-	-	-	-	-	2
CO2	3	2	2	-	2	-	-	-	-	-	-	2
CO3	3	2	2	-	2	-	-	-	-	-	-	2
CO4	3	1	3	-	2	-	-	-	-	-	-	2
CO5	3	1	2	-	1	-	-	-	-	-	-	2

UNIT I

CASTING: Steps involved in making a casting – Advantage of casting and its applications. Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Molding – molding methods - ingredients of molding sand –. Molding materials, Properties of molding sand, Testing of molding sand. Types of molding – Hand molding – Machine molding. Core – different types of cores – materials – properties of core sand – core manufacturing.

UNIT II

Principles of Gating, Gating ratio and design of Gating systems. Risers – Types, function and design, casting design considerations. Methods of melting and types of furnaces - cupola, electric arc, resistance, and induction furnace. Solidification of castings- Solidification of pure metals and alloys-Short & long freezing range alloys. Fettling. Casting defects. Basic principles and applications of special casting processes - Centrifugal casting – True, semi and centrifuging, Die casting, Investment casting and shell molding.

UNIT III

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, power characteristics, Manual metal arc welding, Submerged arc welding, TIG & MIG welding. Electro – slag welding.

Resistance welding, Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma Arc welding, Laser welding, electron beam welding, Soldering & Brazing.

Heat affected zones in welding; pre & post heating, Weldability of metals, welding defects – causes and remedies – destructive and nondestructive testing of welds.

UNIT IV

Plastic deformation in metals and alloys-recovery, recrystallization and grain growth. Hot working and Cold working-Strain hardening and Annealing. Bulk forming processes: Forging - Types of Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing

UNIT V

Sheet metal forming - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and press tools.

High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electrohydraulic forming, rubber pad forming, advantages and limitations.

TEXT BOOKS:

1. Manufacturing Processes for Engineering Materials – Kalpakjian S and Steven RSchmid- Pearson Publ , 5 thEdn.
2. Manufacturing Technology -Vol I- P.N. Rao-TMH

REFERENCE BOOKS:

1. Manufacturing Science – A.Ghosh&A.K.Malik – East West Press Pvt.Ltd
2. Process and materials of manufacture- Lindberg-PHI
3. Production Technology- R.K. Jain-Khanna
4. Production Technology-P C Sharma-S.Chand
5. Manufacturing Processes- H.S. Shaun-Pearson
6. Manufacturing Processes- J.P. Kaushish-PHI
7. Workshop Technology -WAJ Chapman/CBS Publishers&DistributorsPvt.Ltd.
8. Production Technology-HMT- TataMcGrawHill

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104304/
2. https://nptel.ac.in/courses/112/107/112107144/
3. https://nptel.ac.in/courses/112/107/112107219/

II B. Tech I Semester

20A2103404: KINEMATICS OF MACHINES

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Fundamentals of Engineering Mathematics, Engineering Mechanics

Course Objectives:

1. The students completing this course are expected to understand the nature and role of the kinematics of machinery, mechanisms and machines.
2. The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications.
3. It exposes the students to various kinds of power transmission devices like belt, rope, chain and their working principles and their merits and demerits.
4. The objective of this unit is to make student understand gears, power transmission through different types of gears including gear profiles and its efficiency.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand Kinematic joint and mechanism and study the relative motion of parts in a machine without taking into consideration the forces involved.
CO2	Understand various mechanisms for straight line motion and their applications.
CO3	Analyze the motion (velocity and acceleration) of a plane mechanism.
CO4	Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc.
CO5	Select a power transmission system for a given application and analyze motion of different transmission systems
CO6	Decide the no of teeth on a gear and also select the gear teeth depending on the application in the unit of Gears.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	1										
CO2	2	3	1	1								
CO3	1	2	3	3	3							
CO4	1	2	3	3	3							
CO5	1	3	3	3	3							
CO6	1	1	2	3	3							

UNIT I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained.

Grashoff's law , Degrees of freedom, Kutzbach criterian for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversions of quadric cycle chain – single and double slider crank chains.

UNIT II

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.
Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT III

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain. Velocity and acceleration analysis of for a given mechanism, Klein's construction, determination of Coriolis component of acceleration.
PLANE MOTION OF BODY: Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links

UNIT IV

CAMS: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion: Uniform velocity, Simple harmonic motion and uniformacceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3cases.
Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.
BELT DRIVES: Introduction, Belt and rope drives, selection of belt drive- types of belt drives,V- belts, materials used for belt and rope drives, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal

UNIT V

GEARS: Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact
– Introduction to Helical, Bevel and worm gearing.
GEAR TRAINS: Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

TEXT BOOKS

1. Theory of Mechanisms & Machines by Jagadeesh lal, Metropolitan Pvt. Ltd.
2. Theory of Machines by Thomas Bevan/ CBS Publishers

REFERENCE BOOKS:

1. Theory of Machines – S. S Rattan- TMH Publishers
2. Theory of machines and Machinery-Vickers – Oxford.
3. Theory of Mechanisms and machines – A.Ghosh&A.K.Malik – East West Press Pvt.Ltd.
4. Kinematics and dynamics of Machinery- R.L Norton- TATAMcGraw-Hill.

E-RESOURCES:

1. http://www.roboanalyzer.com/mechanalyzer.html
2. https://nptel.ac.in/courses/112104121/
3. https://ocw.mit.edu/courses/mechanical-engineering/2-003j-dynamics-and-control-i-fall- 2007/index.htm
4. https://engineering.dartmouth.edu/academics/courses/engg240

II B. Tech I Semester

20A2103301: THERMODYNAMICS

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Basic Mechanical Engineering, Physics and Mathematics basics.

Course Objectives:

7. To understand the basic concepts of energy conversions and fundamentals of thermodynamics and its application.
8. To acquire the knowledge of first law of thermodynamics and its analysis.
9. To imbibe the knowledge of second law of thermodynamics and significance of entropy principles.
10. To provide an insight concepts of pure substance.
11. To learn the concepts of reactant, non-reactant gas mixtures and gas power cycles.
12. To enable the students learn basics and psychometric properties and chart

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	understand the basic concepts of thermodynamics.
CO2	Comprehend the concepts of laws of thermodynamics and concept of entropy.
CO3	Describe the formation of steam and calculate the quality of steam.
CO4	Analyze thermodynamic cycles, properties of pure substances and their depiction in tables and charts.
CO5	Evaluation of properties of perfect gas mixtures.
CO6	Apply the Concept of psychometric properties

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	1				1					
CO2	3	1	1			1	1					
CO3	3	2	1				1					
CO4	3	2	2	1								
CO5	3	2	1									
CO6	3	1	1			1	1					

UNIT I

Introduction: Basic Concepts : System, boundary, Surrounding, Universe, control volume, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process - Reversible, Quasi static & Irreversible Processes, cycle, Causes of Irreversibility. Energy in State and in Transition - Types, Work and Heat, Point and Path function.

Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature.

UNIT II

First law of Thermodynamics: Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system –Energy balance for closed systems-Specific heats- Internal energy, Enthalpy and Specific heats of Solids, liquids and Ideal gases, Some steady flow energy equation applied to Nozzle, Turbine, Compressor and heat exchanger devices, PMM-I.

UNIT III

Second Law of Thermodynamics: Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, Corollaries, PMM of Second kind, Carnot cycle and its specialties, Carnot's theorem, Thermodynamic scale of Temperature.
Entropy: Clausius Inequality, Entropy, Principle of Entropy Increase, Availability and Irreversibility (Basic definitions) – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV

Properties of Pure Substances: Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point and critical point, properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation, Property tables. Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT V

Mixtures of perfect Gases : Mole Fraction, Mass fraction – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes- Equivalent Gas constant and Molecular Internal Energy, Enthalpy, Specific Heat and Entropy of Mixture of Perfect Gases and Vapour.
Ideal Gas equation of state- Compressibility factor- Van der Waals equation of state- compressibility charts – variable specific heats .
Psychrometry: Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity, Relative Humidity, Saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation , Carrier's Equation – Psychrometric chart.

REFERENCE BOOKS:

TEXT BOOKS:

1. Engineering Thermodynamics , PK Nag 4th Edn , TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles , 7th Edn - McGrawHill
3. Fundamentals of Thermodynamics by Claus Borgnakke Richard E. Sonntag, seventh edition, John Wiley & Sons, Inc

REFERENCES:

1.Thermodynamics by Prasanna Kumar, Pearson Publishers
2. Engineering Thermodynamics – Jones & Dugan PHI
3. Thermodynamics, an Engineering Approach, Yunus A Cenegel, Michael A Boles, 8th Edn inSI Units, McGraw Hill.
4. Thermodynamics – J.P.Holman , McGrawHill
5. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
6. Thermodynamics – W.Z.Black & J.G.Hartley, 3rd Edn Pearson Publ.
7. Engineering Thermodynamics – D.P.Misra, Cengage Publ.
8. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ.

E-RESOURCES:

1. https://nptel.ac.in/courses/112/105/112105123/
2. https://swayam.gov.in/explorer?category=Engineering_and_Technology
3. https://onlinecourses.nptel.ac.in/noc21_me111/preview
4. https://onlinecourses.nptel.ac.in/noc21_me73/preview
5. https://onlinecourses.swayam2.ac.in/nou21_me13/preview
6. https://onlinecourses.swayam2.ac.in/cec21_ce03/preview
7. https://onlinecourses.nptel.ac.in/noc21_me92/preview

II B. Tech I Semester

20A2103491: FLUID MECHANICS & HYDRAULIC MACHINES LAB

practical	2 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Fundamentals of fluid mechanics.

Course Objectives:

1. Determination of coefficient of discharge using venture meter.
2. To impart hands-on practical exposure on , orifice meter and mouth piece.
3. To impart hands-on practical exposure on measure the losses in pipes.
4. To impart hands-on practical exposure on jet on vanes
5. To impart hands-on practical exposure on Bernoulli's theorem
6. To impart hands-on practical exposure on the performance of hydraulic machines viz.

Turbines and Pumps.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Find coefficient of discharge for venture meter
CO2	Demonstrate the concepts of discharge through orifice meter and mouthpiece.
CO3	Explain the concepts of loses in the pipe flow
CO4	Explain the concepts of jet on vanes.
CO5	Demonstrate the concept of Bernoulli's theorem.
CO6	Analyze the performance of deferent turbines of and pumps.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2								1		
CO2	3	2								1		
CO3	3	3								1		
CO4	3	3								2		
CO5	3	3								2		
CO6	3	2								2		

List of Experiments

1. Determination of coefficient of impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multistage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Determination of coefficient of discharge for Venturimeter.
9. Determination of coefficient of discharge for Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Calibration of Turbine flow meter.
13. To verify the Bernoulli's Theorem.
14. Determination of coefficient of discharge for mouthpiece.
15. To find critical Reynolds number for a pipe flow.
16. To determine coefficient of discharge of Rectangular /Triangular Notch.

17. To determine coefficient of discharge for a small orifice by constant head method.

(Any TEN of the above experiments are to be covered)

REFERENCE BOOKS:

1 P. N Modi, S.M Seth, Fluid mechanics and hydraulic machines,14th edition standard book house,2002.
2. R.K Bansal, A text book of Fluid mechanics and hydraulic machines, reprint, Lakshmi publications limited,2019.
3. Fluid mechanics and hydraulic machines lab manual by Department of Mechanical Engineering. NRIIT, Pothavarappadu.

E-RESOURCES:

1. https://www.autoform.com/
2. https://www.omniamfg.com/fluid mechanics.

II B. Tech I Semester

20A2103492: PRODUCTION TECHNOLOGY LAB

Lecture – Tutorial- Practical:	0-0-2	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Engineering Workshop, Engineering Graphics

Course Objectives:

To impart hands-on practical exposure on manufacturing processes and equipment.

Course Outcomes:

Upon Successful Completion of the Course, The Student will be able to:

CO1	Choose a suitable primary production process to design an industrial component.
CO2	Select a suitable production process for fabrication of designed component.
CO3	Choose a suitable mechanical press working operation to get the required shape of component.
CO4	Manufacture a plastic component using various plastic processing techniques.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	3	1	-	-	-	2	-	-	1
CO2	3	2	2	2	-	-	-	-	2	-	-	1
CO3	3	1	2	3	1	-	-		2	-	-	1
CO4	3	1	2	2	-	-	-	-	2	-	-	1

List of Experiments:

1. Design and making of pattern
   i. Single piece pattern
   ii. Split pattern
2. Sand properties testing
   i. Sieve analysis (dry sand)
   ii. Clay content test
   iii. Moisture content test
   iv. Strength test (Compression test & Shear test)
   v. Permeability test
3. Mould preparation
   i. Straight pipe
   ii. Bent pipe
   iii. Dumble
   iv. Gear blank
4. Gas cutting and welding
5. Manual metal arc welding
   i. Lap joint
   ii. Butt joint
6. Injection Molding
7. Blow Molding

8. Simple models using sheet metal operations
9. Study of deep drawing and extrusion operations
10. Study of Basic powder compaction and sintering
11. Study of TIG/MIG Welding
12. Study of Resistance Spot Welding
13. Study of Brazing and soldering
14. Study of Plastic Moulding Process.

EQUIPMENT REQUIRED:

1. Blow Moulding Machine with Die.
2. Injection Moulding Machine with Die.
3. Hydraulic Press with Blanking and Piercing Operation Dies.
4. Spot Welding Machine.
5. Arc Welding Machine and Accessories.
6. Gas Welding and Gas Cutting.
7. Soldering.
8. Sand Rammer.
9. Electric Heater.
10. Rapid Sand Moisture Tester.
11. Sand Property Testing for Strength.
12. Sand Property Testing for Permeability.
13. TIG Welding
14. Tools for Deep Drawing Operation Suitable for Hydraulic Press.
15. Bending Operation Machine (Fly Press Type) with Die.
16. Foundry Tools and Equipment.
17. Argon Cylinder.

REFERENCE BOOKS:

1. Manufacturing Science – A.Ghosh&A.K.Malik – East West Press Pvt.Ltd
2. Process and materials of manufacture- Lindberg-PHI
3. Production Technology- R.K. Jain-Khanna
4. Production Technology-P C Sharma-S.Chand
5. Manufacturing Processes- H.S. Shaun-Pearson
6. Manufacturing Processes- J.P. Kaushish-PHI
7. Workshop Technology -WAJ Chapman/CBS Publishers&DistributorsPvt.Ltd.

Production Technology-HMT- TataMcGrawHill

E-RESOURCES:

1. https://nptel.ac.in/courses/112/104/112104304/
2. https://nptel.ac.in/courses/112/107/112107144/
3. https://nptel.ac.in/courses/112/107/112107219/

20A2103991: DRAFTING AND MODELLING LAB

Lecture – Practical:	**0 - 2 Hours**	**Internal Marks:**	**15**
Credits:	**1.5**	**External Marks:**	**35**

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills
3. Engineering Drawing
4. Knowledge in AutoCAD

Course Objectives:

1. To learn the methods of Isometric and Perspective views.
2. To introduce various commands in AutoCAD, to draw the geometric entities and to create 2D and 3D wire frame models.
3. To understand the concept of DXE and IGES files.
4. Development of part drawings for various components in 3D by using autoCAD.
5. To know the geometrical model of simple solids, machine parts and display the same as an Isometric, Orthographic or Perspective projection.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the projections of solids which are essential in 3D modeling and animation.
CO2	Understanding the study of DXE and IGES files.
CO3	Understand the hidden details of machine components with the help of sections and interpenetrations of solids.
CO4	Understand the various commands in AutoCAD and to draw the geometric entities and to create 2D and 3D wire frame models.
CO5	Understand the modeling commands for generating 2D and 3D objects using computer aided drafting tools.
CO6	Understand the concept of computer aided solid modeling

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	3	-	1
CO2	3	2	-	-	-	-	-	-	-	3	-	1
CO3	3	2	-	-	-	-	-	-	-	3	-	1
CO4	3	2	-	-	3	-	-	-	-	3	-	1
CO5	3	2	-	-	3	-	-	-	-	3	-	1
CO6	3	2	-	-	3	-	-	-	-	3	-	1

Contents

DRAFTING: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances, Study of DXE, IGES files.

SURFACE MODELING - Generation of various Surfaces using surface modeling.

A) DRAFTING: Development of part drawings for various components in the form of orthographic and isometric. Representation of dimensioning and tolerances, Study of DXE, IGES files.

B) SURFACE MODELING - Generation of various Surfaces using surface modeling.

C) The following contents to be done by any 3D software package:

(i) PART MODELING: Generation of various 3D models through Pad, revolve, shell, sweep, parent child relation, Boolean operations and various standard translators.

(ii) Assembly drawings: (Any four of the following using solid model software) Generation of various Parts/assemblies: like Screw Jack, Oldham's Coupling, Footstep bearing, Couplings, knuckle and cotter joints, Crankshaft, Connecting Rod, Piston and Cylinder)

TEXT BOOKS:

1. Engineering drawing by N.D Bhatt , Charotar publications.
2. Engineering Graphics, K.C. john, PHI Publications

REFERENCE BOOKS:

1. Mastering Auto CAD 2013 and Auto CAD LT 2013 – George Omura, Sybex
2. Auto CAD 2013 fundamentals- Elisemoss, SDC Publ.
3. Engineering Drawing and Graphics using Auto Cad – T Jeyapoovan, vikas
4. Engineering Drawing + AutoCAD – K Venugopal, V. Prabhu Raja, New Age
5. Engineering Drawing – RK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson
7. Engineering Drawing – KL Narayana, P Kannaiah, Scitech
8. Engineering Drawing – Agarwal and Agarwal, Mc Graw Hill
9. Engineering Graphics – PI Varghese, Mc Graw Hill
10. Text book of Engineering Drawing with auto-CAD , K.venkata reddy/B.S . publications.
11. Engineering Drawing with Auto CAD/ James D Bethune/Pearson Publications
12. Engineering Graphics with Auto CAD/Kulkarni D.M, Rastogi A.P, Sarkar A.K/PHI Publications

End Semester examination shall be conducted for **Four** hours with the following pattern

a) Two hours-Conventional drawing
b) Two hours – Computer Aided Drawing

II B. Tech I Semester

20A2100801: CONSTITUTION OF INDIA

Lecture – Tutorial:	2-0 Hours	**Internal Marks:**	30
Credits:	0	**External Marks:**	70

Prerequisites: Nil

Course Objectives:

1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court, comptroller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand historical background of the constitution making and its importance for building a democratic India.
CO2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary
CO3	Understand the structure of state government - Governor and Chief Minister, the role of state Secretariat
CO4	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO5	Analyze the decentralization of power between central, state and local self-government
CO6	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	3	-	-	2	-	1	-
CO2	-	-	-	1	-	-	2	-	-	-	3	-
CO3	-	-	-	1	-	-	-	-	-	2	3	-
CO4	-	-	-	-	-	3	-	-	-	2	1	-
CO5	-	-	-	-	-	2	-	-	-	1	3	-

CO6	-	-	-	1	-	-	-	-	-	2	3	-

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution- Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level, Role of Elected and Appointed officials - Importance of grass root democracy

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women

TEXT BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. NewDelhi
2. Subash Kashyap, Indian Constitution, National Book Trust

REFERENCE BOOKS:

1. A. Siwach, Dynamics of Indian Government & Politics
2. D.C. Gupta, Indian Government and Politics
3. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
4. J.C. Johari, Indian Government andPolitics Hans
5. J. Raj IndianGovernment and Politics
6. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law,Prentice –Hall of India Pvt. Ltd.. New Delhi
7. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right),Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

II B. Tech II Semester

20A2203301: MATERIALS SCIENCE & METALLURGY

Lecture Tutorial:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Engineering Physics, Engineering Chemistry.

Course Objectives: The student will

13.	Acquire knowledge of basic structure and crystal arrangement of materials.
14.	Understand the phase and importance of the phase diagram.
15.	Acquire awareness of the ferrous and non-ferrous materials.
16.	Gain the knowledge of heat treatment and various methods.
17.	Know how the powder metallurgy processes and applications of composites.
18.	Acquire knowledge of all the materials useful to the research and ultimately reaches the society

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Estimate the properties of the metals and alloys based on structures.
CO2	Classify, construct and analyze equilibrium diagrams.
CO3	Analyze and distinguish various ferrous, non-ferrous metals and alloys.
CO4	Identify the influence of mechanical working and heat treatment principles on
CO5	Classify, analyze and suggest the suitable manufacturing method for composite materials and Powder metallurgy.
CO6	Able to suggest the suitable material for any applications demand by the society

Contribution of Course Outcomes towards the achievement of Program Outcomes (1 Low, 2 Medium, 3 High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	-	-	-	-	-	-	-	2	-	-
CO2	-	3	3	-	-	-	3	-	-	-	-	-
CO3	-	3	3	2	-	-	-	-	-	-	-	-
CO4	-	3	3	3	-	2	-	-	-	-	-	-
CO5	-	-	-	3	-	2	2	-	-	-	-	-
CO6	-	3	3	3	-	-	-	-	-	-	-	-

UNIT I

Structure of Metals and Constitution of alloys: Bonds in Solids, Metallic bond, crystallization of metals, Packing Factor - SC, BCC, FCC& HCP-line density, plane density. Grain and grain boundaries, effect of grain boundaries on the Properties of metal / alloys – determination of grain size. Imperfections – point, line, surface and volume- Slip and Twinning. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds

Equilibrium Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagrams such as Cu-Ni and Fe-Fe3C.

UNIT II

Ferrous metals and alloys: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels,

tool and die steels.

Non-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys, Magnesium and its alloys, Super alloys.

UNIT III

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT IV

Powder Metallurgy: Basic processes- Methods of producing metal powders- milling atomization- Granulation-Reduction-Electrolytic Deposition. Compacting methods – Sintering - Methods of manufacturing sintered parts. Sintering Secondary operations-Sizing, coining, machining -Factors determining the use of powder metallurgy-Application of this process.

UNIT – V

Ceramic and composite materials: Crystalline ceramics, glasses, cermets, abrasive materials, Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites. Nano-materials – definition, properties and application

TEXTBOOKS

3. Introduction to Physical Metallurgy - Sidney H. Avener -McGrawHill
4. Essential of Materials science and engineering - Donald R.Askeland -Cengage.

REFERENCE BOOKS:

1. Material Science and Metallurgy – Dr. V.D.kodgire- Everest PublishingHouse
2. Materials Science and engineering - Callister&Baalasubrahmanyam- Wiley Publications
3. Material Science for Engineering students – Fischer – ElsevierPublishers
4. Material science and Engineering - V. Rahghavan-PHIPublishers
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRCPress
6. Material Science and Metallurgy – A V K Suryanarayana – B SPublications
7. Material Science and Metallurgy – U. C. Jindal – PearsonPublications

E-RESOURCES:

1) Prof.R.N.Ghosh, IIT Kharagpur, Solidification Binary Alloys, Iron-Carbon Phase Diagram,[English]WebAvailable:
https://www.youtube.com/results?search_query=prof.r.n+ghosh+lecturers

2) Prof.S.K.Gupta, IIT Delhi, Phase Diagrams, Crystal imperfections [English] Web Available:https://www.youtube.com/watch?v=x3n9ht-eRfg

II B. Tech II Semester

20A2200201: COMPLEX VARIABLES AND STATISTICAL METHODS

Lecture – Tutorial:	L-T Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:--- NIL

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT – I: Functions of a complex variable and Complex integration: (10 hrs)

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates –Harmonicand conjugate harmonic functions – Milne – Thompson method.

Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.

UNIT – II: Series expansions and Residue Theorem: (10 hrs)

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.

Types of Singularities: Isolated – Essential –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types

UNIT – III: Probability and Distributions: (10 hrs)

Review of probability and Baye's theorem – Random variables – Discrete and Continuous

random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.

UNIT – IV: Sampling Theory: (8 hrs)

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions –
Introduction to t,
χ 2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT – V: Tests of Hypothesis: (10 hrs)

Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.

REFERENCE BOOKS:

1. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
3. Jay 1. Devore, Probability and Statistics for Engineering and the Sciences, 8thEdition, Cengage.
4. ShronL.Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
5. Sheldon, M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4thEdition, Academic Foundation, 2011

E-RESOURCES:

1.nptel

II B. Tech II Semester

20A2203401: DYNAMICS OF MACHINERY

Lecture Tutorial:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Engineering Mechanics, Kinematics of Machinery, Machine Drawing.

Course Objectives: The student will be able

1.	To analyze the forces in clutches, brakes and dynamometers involving friction
2.	Understand the effect gyroscopic couple in motor cycles, aeroplanes and ships.
3.	To understand the static and dynamic force analysis of four bar and slider crank mechanisms.
4.	To study the turning moment diagrams of reciprocating engines and to learn design procedure of a flywheel.
5.	To learn analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
6.	Understanding of vibrations and its significance on engineering design.

Course Outcomes:

Upon successful completion of the course, the students will develop ability: the student will be able to:

CO1	To compute the frictional losses and transmission in clutches, brakes and dynamometers
CO2	To determine the effect of gyroscopic couple in motor vehicles, ships and aero planes.
CO3	To analyze the forces in four bar and slider crank mechanisms and design a flywheel.
CO4	To determine the rotary unbalanced mass in reciprocating equipment.
CO5	To determine the unbalanced forces and couples in reciprocating and radial engines.
CO6	To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.

Contribution of Course Outcomes towards the achievement of Program Outcomes (1 Low, 2 Medium, 3 High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	3	-	-	-	-	-	-	-	-	1
CO2	3	2	3	-	-	-	-	-	-	-	-	1
CO3	3	2	3	-	-	-	-	-	-	-	-	1
CO4	3	2	3	-	-	-	-	-	-	-	-	1
CO5	3	2	3	-	-	-	-	-	-	-	-	1
CO6	3	2	3	-	-	-	-	-	-	-	-	1

UNIT I

FRICTION: Inclined plane, friction of screw and nuts, pivot and collar, uniform pressure, uniform wear, friction circle and friction axis: lubricated surfaces, boundary friction, film lubrication.

CLUTCHES: Friction clutches- single disc or plate clutch, multiple disc clutch, cone clutch, centrifugal clutch.

BRAKES AND DYNAMOMETERS: Simple block brakes, internal expanding brake, band brake of vehicle: General description and operation of dynamometers: Prony, Rope brake, Epicyclic, Bevis Gibson and belt transmission.

UNIT II

STATIC AND DYNAMIC FORCE ANALYSIS: Dynamic force analysis of four bar mechanism and slider crank mechanism, inertia torque, angular velocity and acceleration of connecting rod, crank effort **TURNING MOMENT DIAGRAMS:** Turning moment diagrams, – fluctuation of energy – fly wheels and their design.

UNIT III

PRECESSION: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motorcycle, aero planes and ships.

GOVERNERS: Watt, porter and proell governors, spring loaded governors – Hartnell and

Hartung with auxiliary springs. sensitiveness, isochronism and hunting.

UNIT IV

BALANCING: Balancing of rotating masses single and multiple – single and different planes, use analytical and graphical methods. Primary, secondary, and higher balancing of reciprocating masses. analytical and graphical methods, unbalanced forces and couples – examination of "V" multi cylinder in line and radial engines for primary and secondary balancing, locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT – V

VIBRATIONS: Free Vibration of spring mass system –Natural frequency-types of damping – damped free vibration, Simple problems on forced damped vibration, vibration isolation and transmissibility transverse loads, vibrations of beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

TEXTBOOKS

5. Theory of Machines / S.S Rattan/ Mc. Graw Hill
6. Mechanism and machine theory /Ashok G. Ambedkar/PHI Publications.

REFERENCE BOOKS:

Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
Theory of Machines / Shigley / MGH
Theory of Machines / Thomas Bevan / CBS Publishers
Theory of machines / Khurmi/S.Chand.

E-RESOURCES:

1. Video in web: http://nptel.ac.in/courses/112104114
2. Video in web: https://youtu.be/OlZXxPVpmBs
3. Notes in web: http://www.vssut.ac.in/lecture_notes/lecture1429901026.pdf.

II B. Tech II Semester

20A2203402: THERMAL ENGINEERING - I

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Thermodynamics

Course Objectives:

1. To make the student learn and understand the reasons and affects of various losses that occur in the actual engine operation.
2. To familiarize the student with the various engine systems along with their function and necessity.
3. To learn about normal combustion phenomenon and knocking in S.I. and C.I. Engines and to find the several engine operating parameters that affect the smooth engine operation.
4. To make the student learn to perform testing on S.I and C.I Engines for the calculations of performance and emission parameters.
5. To familiarize the student with the Gas Turbine Plant along with the parameters of performance
6. To make the student learn and understand the theoretical concepts of Rockets

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.
CO2	Explain working principle and various components of IC engine
CO3	Explain combustion phenomenon of CI and SI engines and their impact on engine variables.
CO4	Analyze the performance of an IC engine based on the performance parameters.
CO5	Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine.
CO6	Explain the applications and working principle of rockets and jet propulsion.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	1	1	1	2	3	3	2				3
CO2	3	1	2	1	2	2	2	3				2
CO3	2	3	1	2	1	3	2	2				2
CO4	2	2	1	2	2	2	1	2				3
CO5	2	3	2	1	2	3	2	2				2
CO6	3	1	1	2	1	2	1	1			2	3

UNIT I

Air standard Cycles: otto, diesel and dual cycles, its comparison, Brayton cycle

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blowdown-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.

UNIT II

I. C. ENGINES: Classification - Working principles, Valve and Port Timing Diagrams, - Engine systems – Fuel, Carburettor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine, principles of supercharging and turbocharging.

UNIT III

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Types of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types.

Combustion in C.I. Engines : Four stages of combustion – Delay period and its importance –

Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used –

fuel requirements and fuel rating.

UNIT IV

Measurement, Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet
and chart.

UNIT-V

GAS TURBINES: Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed cycle type gas turbines.

JET PROPULSION: Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsion efficiency – turbo jet engines – needs and demands met by turbo jet – schematic diagram, thermodynamic cycle, performance evaluation (Definitions and Simple Problems).

ROCKETS: Application – working principle – classification – propellant type – thrust, propulsive efficiency – specific impulse – solid and liquid propellant rocket engines (only Theoretical concepts).

TEXT BOOKS

1. I.C. Engines - V. Ganesan- Tata McGraw Hill Publishers
2. Gas Turbines – V.Ganesan – Tata McGraw HillPublishers

REFERENCE BOOKS:

1. Thermal Engineering - Mahesh Rathore- McGraw Hillpublishers
2. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick-2ndEdition WileyPubl
3. I.C. Engines - J.B.Heywood/McGrawHIll.
4. Heat engines, Vasandani& Kumar – Thermalpublications
5. Gas Turbine Theory – HIH Saravanamuttoo, Cohen, Rogers –PearsonPublishers

II B. Tech II Semester

20A2200102: INDUSTRIAL ENGINEERING AND MANAGEMENT

Lecture – Tutorial:	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70
Prerequisites:			

Fundamentals of Engineering mathematics, probability and statistics

Course Objectives:

1.To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics and the domain knowledge of Industrial Management and Engineering.

2.To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.

3.To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.

4.To enable students to understand their role as engineers and their impact to society at the national and global context.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design and conduct experiments, analyse, interpret data and synthesize validconclusions
CO2	Design a system, component, or process, and synthesize solutions to achieve desiredneeds
CO3	Use the techniques, skills, and modern engineering tools necessary for engineering practicewith appropriate considerations for public health and safety, cultural, societal, andenvironmental constraints
CO4	identify the role of statistics in engineering problem solving process, use of graphical techniques in data analysis
CO5	use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
CO6	Function effectively within multi-disciplinary teams and understand the fundamental preceptsof effective project management

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3							2	1			
CO2			3	1	2						1	
CO3			1		3	2						
CO4		3	2		1							
CO5	2				3						1	
CO6	2				1						3	

UNIT I

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role ofan industrial engineer, differences between production management and industrial engineering, quantitative tools of IE and productivity measurement. concepts of management, importance, functions of management, scientific management, Taylor's principles, theory X and theory Y,Fayol's principles of management.

UNIT II

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantagesand disadvantages of process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

UNIT III

WORK STUDY: Importance, types of production, applications, workstudy, method study and time study, work sampling, PMTS, micro-motion study, rating techniques, MTM, work factor system, principles of Ergonomics, flow process charts, string diagrams and Therbligs

UNIT IV

STATISTICAL QUALITY CONTROL: Quality control, Queing assurance and its importance,SQC, attribute sampling inspection with single and double sampling, Control charts – X and R –charts X and S charts and their applications, numerical examples.

TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation,applications, ISO quality systems. six sigma – definition, basic concepts

UNIT V

RESOURCE MANAGEMENT: Concept of human resource management, personnel management and industrial relations, functions of personnel management, Job-evaluation, its importance and types, merit rating, quantitative methods, wage incentive plans, types.

VALUE ANALYSIS: Value engineering, implementation procedure, enterprise resource planning and supply chain management.

TEXT BOOKS

1. Industrial Engineering and management / O.P Khanna/KhannaPublishers.
2. Industrial Engineering and Production Management/ Martand Telsang/ S.Chand & Company Ltd. New Delhi

REFERENCE BOOKS:

1. Industrial Management / Bhattacharya DK/Vikaspublishers
2. Operations Management / J.G Monks/McGrawHillPublishers.
3. Industrial Engineering and Management Science/T.R. Banga, S.C.Sharma, N. K. Agarwal /Khanna Publishers
4. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.
5. Statistical Quality Control /Gupta/KhannaPublishers
6. Industrial Engineering and Management /NVS Raju/Cengage Publishers

E-RESOURCES:

https://nptel.ac.in/courses/112/107/112107142/
https://nptel.ac.in/courses/122/105/122105020/
https://nptel.ac.in/courses/112/107/112107238/
https://ocw.mit.edu/index.htm
https://doabooks.org/
https://ndl.iitkgp.ac.in/
https://www.jiem.org/index.php/jiem
https://www.academia.edu/1399243/E_Resources_for_Industrial_Engineering_Students?auto=download

II B. Tech II Semester

20A2203391: MECHANICS OF SOLIDS AND METALLURGY LAB

practical	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Engineering Physics, Engineering Chemistry, Engineering mechanics

Course Objectives:

1) This course provides to acquire knowledge of destructive test
2) To understand the mechanical properties of the materials.
3) Gain knowledge in testing the tensile, hardness, impact for a material
4) Basic knowledge of materials, preparation of specimen
5) To understand the evaluation of microstructure
6) To understand the concept of heat treatment practically

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Perform the UTM test of a material.
CO2	Perform various test to know the mechanical properties of a material
CO3	Perform hardness test and heat treatment of steels.
CO4	Prepare the specimens as per standards.
CO5	Observe micro structure of different materials.
CO6	Analyse the properties of materials based on micro structure.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	3	-	2	-	-	-	-	-	2	-	-
CO2	1	2	-	2	-	-	-	-	-	-	-	-
CO3	-	3	-	2	-	-	-	-	-	-	-	-
CO4	-	3	-	2	-	-	-	-	-	-	-	-
CO5	-	3	-	-	-	1	-	-	-	-	-	-
CO6	-	2	-	3	-	-	1	-	-	-	-	-

(A) MECHANICS OF SOLIDSLAB:

1. Direct tension test
2. Bending test on a) Simple supported b) Cantilever beam
3. Torsion test
4. Hardness test a) Brinells hardness test b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

(B) METALLURGYLAB:

1. Preparation and study of the Micro structure of pure metals like Iron, Cu and Al.
2. Preparation and study of the Micro structure of Mild steel, Medium carbon steels, High carbon steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardeneability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

Note: Minimum of 12 Experiment need to be performed

Any 6 experiments from each section A and B.

EQUIPMENT REQUIRED

1) Simple supported beam
2) Cantilever beam
3) Universal testing machine
4) Impact test
5) Hardness test
6) Compression machine
7) Spring test
8) Hot mounting press
9) Stand polishing machine
10) Disc polishing machine
11) microscopes

II B. Tech II Semester

20A2203491: MACHINE DRAWING PRACTICE

practical 3 Hours **Internal Marks:** 15

Credits: 1.5 **External Marks:** 35

Prerequisites:

Knowledge of basic Mathematics, Drawing skills, Engineering Drawing, Knowledge in AutoCAD

Machine Drawing Conventions:

Need for drawing conventions – introduction to IS conventions-Standardization-Interchangeability-
Selective assembly-Tolerance
a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c) Methodsofdimensioning,generalrulesforsizesandplacementofdimensionsforholes, centers, curved tapered features and surface finish indication
d) Title boxes, their size, location and details - common abbreviations & their liberal usage
e) Types of Drawings – working drawings for machine parts

Course Objectives:

The student will acquire knowledge in national and International standards while drawing machine components students will also familiarize in drawing assembly, orthographic and sectional views of various machine components.

1. To learn the methods of Isometric and Perspective views.
2. To introduce various commands in AutoCAD, to draw the geometric entities and to create 2D and 3D wire frame models.
3. To understand the concept of DXE and IGES files.
4. Development of part drawings for various components in 3D by using autoCAD.
5. To know the geometrical model of simple solids, machine parts and display the same as an Isometric, Orthographic or Perspective projection.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the projections of solids which are essential in 3D modeling and animation.
CO2	Understanding the study of DXE and IGES files.
CO3	Understand the hidden details of machine components with the help of sections and interpenetrations of solids.
CO4	Understand the various commands in AutoCAD and to draw the geometric entities and to create 2D and 3D wire frame models.
CO5	Understand the modeling commands for generating 2D and 3D objects using computer aided drafting tools.
CO6	Understand the concept of computer aided solid modeling

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	3	-	1
CO2	3	2	-	-	-	-	-	-	-	3	-	1
CO3	3	2	-	-	-	-	-	-	-	3	-	1

CO4	3	2	-	-	3	-	-	-	-	3	-	1
CO5	3	2	-	-	3	-	-	-	-	3	-	1
CO6	3	2	-	-	3	-	-	-	-	3	-	1

I. Drawing of Machine Elements and simple parts
Objective: To provide basic understanding and drawing practice of various joint, simple
mechanical parts
Selection of Views, additional views for the following machine elements and parts with every drawing proportions.
a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, setscrews.
b) Keys, cotter joints, knuckle joint, Hook'sjoint
c) Riveted joints for plates
d) Shaft couplings.
e) Journal, pivot and collar and foot step bearings.

II. Assembly Drawings:
Objective: The student will be able to draw the assembly from the individualpart drawing. Drawings of assembled views for the part drawings of the following using conventions and easy drawingproportions.
a) Engine parts –Gear pump, Fuel pump, petrol Engine connecting rod, piston, stuffing boxand eccentric assembly.
b) Other machine parts - Screws jack, Machine swivel vice, Plummer block, Tailstock and Tool post.

III. Manufacturing Drawing
Introduction of Limits and fits, fundamental deviations for Hole based and Shaft based systems,
alpha numeric designation of limits & fits. Types of Fits. Form and positional tolerances. Conventional practices of indicating limits and fits, geometrical form and position tolerances,
surface finish and surface treatments requirements. Study of Examples involving selection of fits
and calculation of limits. Suggestion of suitable fits for mating parts.
Representation of limits fits and tolerances for mating parts. Use any four parts of above assembly
drawings and prepare manufacturing drawing with dimensional and geometric tolerances.

TEXT BOOKS:

1. Machine Drawing – N.Siddeswar, K.Kannaiah&V.V.S.Sastry -TMH
2. Machine Drawing –K.L.Narayana, P.Kannaiah&K. Venkata Reddy / New Age/Publishers
3. Production Drawing- K.L.Narayana, P.Kannaiah&K. Venkata Reddy / New Age/Publishers

REFERENCE BOOKS:

1. Machine Drawing –P.S.Gill,
2. Machine Drawing –Luzzader
3. Machine Drawing –Rajput
4. Machine Drawing – N.D. Junnarkar,Pearson
5. Machine Drawing – Ajeeth Singh, McGrawHill
6. Machine Drawing – KC John,PHI
7. Machine Drawing – B Battacharya,Oxford
8. Machine Drawing – Gowtham and Gowtham,Pearson
9. Machine Drawing- Dhawan R K-S.chand&Company.

Course End Semester examination shall be conducted for **Three** hours with the

following pattern

c) One hour-Conventional drawing
d) Two hours – Computer Aided Drawing

II B. Tech II Semester

20A2203492: THEORY OF MACHINES LAB

practical	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Fundamentals of Engineering Mechanics.

Course Objectives:

1. To understand and impart hands-on practical exposure on different types of assemblies and linkages used in machine parts.
2. To understand the principles of gyroscope and governors.
3. To determine the balancing of masses of rotating machine elements.
4. To determine the moment of inertia of various mechanical systems.
5. To familiarize higher pairs like cams and gears
6. To understand the vibrational behavior of systems.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	To analyze the forces and motion of complex systems of linkages, gears and cams.
CO2	To apply the principles of gyroscope and governors.
CO3	To apply the principles of balancing of masses to various links, mechanisms and engines.
CO4	To demonstrate the dynamics of flywheel and their motion.
CO5	To analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams.
CO6	To perform balancing, vibration and critical speeds with respect to Machine dynamics.

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	2	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	-	2	-	-	-	-	-	-	-	-
CO6	3	2	-	2	-	-	-	-	-	-	-	-

List of Experiments:

1. To determine whirling speed of shaft theoretically and experimentally
2. To determine the position of sleeve against controlling force and speed of a Hartnell governor
3. To analyze the motion of a motorized gyroscope when the couple is applied along its spin axis
4. To determine the frequency of undamped free vibration of an equivalent spring mass system
5. To determine the frequency of damped force vibration of a spring mass system
6. To analyze the static and dynamic balancing using rigid blocks
7. To find the moment of inertia of a flywheel
8. To plot follower displacement vs cam rotation for various Cam Follower systems
9. To find coefficient of friction between belt and pulley
10. Simulation and study of four bar mechanisms.
11. Simulation and study of slider crank mechanisms.
12. To study various types of gears- Spur, Helical, Worm and Bevel Gears.

(Any TEN of the above experiments are to be covered)

EQUIPMENT REQUIRED:

Whirling of Shaft Apparatus, Universal Governor Apparatus, Motorized Gyroscope, Universal Vibration Apparatus, Static & Dynamic Balancing Apparatus, Inertia of a Flywheel Apparatus, Cam Analysis Apparatus, and Apparatus for Determination of

Co-efficient of Friction Between Belt & Pulley.

REFERENCE BOOKS:

1. Rattan, "Theory of machine", Tata McGraw-Hill Publishing Co. Ltd, New Delhi
2. P. Ballaney, "Theory of machine", Khanna Publication, New Delhi
3.Thomas Beven, "Theory of machine", C B S Publisher
4. Shigley and Vicker, "Theory of machine", McGraw-Hill Publishing Co. Ltd, New Delhi
5. J. S. Rao & R. V. Dukkipati, Mechanism & Machine Theory, New Age Publication.
6.Theory of Machines by Dr. Sadhu Singh Pearson Education.
7. Theory or Mechanisms and Machines by Amitabh Ghosh and A. Kumar Mallik.

E-RESOURCE:

http://www.nptelvideos.in/2012/12/kinematics-of-machines.html

II B. Tech II Semester

20A2203492: PYTHON PROGRAMMING LAB

practical	3 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Course Objectives:

To understand the PYTHON environment and make numerical computations and analysis.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Solve the different methods for linear, non-linear and differential equations
CO2	Learn the PYTHON Programming language
CO3	Familiar with the strings and matrices in PYTHON
CO4	Write the Program scripts and functions in PYTHON to solve the methods

Contribution of Course Outcomes towards achievement of Program Outcomes (1– Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	--	--	--	3	--	--	--	3	--	3	--
CO2	--	3	2	--	--	--	--	--	--	--	--	--
CO3	--	--	--	2	3	--	--	--	3	--	--	--
CO4	--	--	--	3	3	--	--	--	3	--	--	--

List of Experiments:

1. To find the roots of non-linear equation using Bisection method
2. To find the roots of non-linear equation using Newton Raphson's method.
3. Curve fitting by least – square approximations
4. To solve the system of linear equations using Gauss - elimination method
5. To solve the system of linear equations using Gauss - Siedal method
6. To solve the system of linear equations using Gauss - Jordan method
7. To integrate numerically using Trapezoidal rule
8. To integrate numerically using Simpsons rule
9. To find the largest eigen value of a matrix by Power – method
10. To find numerical solution of ordinary differential equations by Euler's method
11. To find numerical solution of ordinary differential equations by Runge-Kutta method
12. To find numerical solution of ordinary differential equations by Milne's method
13. To find the numerical solution of Laplace equation
14. To find the numerical solution of Wave equation
15. To find the solution of a tri-diagonal matrix using Thomas algorithm
16. To fit a straight using least square technique

REFERENCE BOOKS:

1. Python Programming: A Modern Approach , Vamsi Kurama,Pearson
2. Learning Python , Mark Lutz ,Orielly

E-RESOURCE:

17. https://www.tutorialspoint.com/python/
18. https://docs.python.org/3/tutorial/
19. https://www.w3schools.com/python/
20. https://www.javatpoint.com/python-tutorial

II B. Tech II Semester

20A2200801: ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Lecture – Tutorial:	2	**Internal Marks:**	30
Credits:	0	**External Marks:**	70

Prerequisites:

Students are expected to have knowledge on

1. Reasoning and inference sustainability is at the course of Indian traditional knowledge system
2. legal framework and traditional knowledge and biological diversity and geographical indication act
3. Mechanism of traditional knowledge and protection
4. Traditional knowledge in different sector

Course Objectives:

1. The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
2. To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act2003
3. The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection
4. To know the student traditional knowledge in different sector

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the concept of Traditional knowledge and its importance
CO2	Know the need and importance of protecting traditional knowledge
CO3	Know the various enactments related to the protection of traditional knowledge
CO4	Understand the concepts of Intellectual property to protect the traditional knowledge
CO5	Understand the Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture
CO6	Know the importance of TK and biotechnology, TK in agriculture

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	1	2	1	1	2	-	1
CO2	-	-	-	-	-	1	1	1	2	1	-	1
CO3	-	-	-	-	-	1	2	1	1	1	-	1
CO4	-	-	-	-	-	2	1	1	1	1	-	1
CO5	-	-	-	-	-	2	2	2	1	2	-	1
CO6	-	-	-	-	-	1	2	2	2	2	-	-

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and

social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.Geographical indications act 2003.

UNIT IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha,2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan2012.
3. Traditional Knowledge System in India by Amit Jha Atlantic publishers,2002
4. "Knowledge Traditions and Practices of India" Kapil Kapoor, MichelDanino

e-Resources:

1) https://www.youtube.com/watch?v=LZP1StpYEPM
2) http://nptel.ac.in/courses/121106003/

NRI INSTITUTE OF TECHNOLOGY

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POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

2021 – 2022

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE FOR FINAL YEAR B.TECH PROGRAMME

NRIA18

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A4104401	Microwave Engineering	3	1	-	4	40	60	100	4
2	18A4104402	Optical Communication	3	-	-	3	40	60	100	3
3	18A4104403	Digital Image Processing	3	1	-	4	40	60	100	4
4	18A4104511 18A4104513 18A4104512	**Professional Elective III** (i)Satellite Communications & RADAR Engineering (ii) Data Base Management Systems (iii) Embedded System Design	3	-	-	3	40	60	100	3
5	18A4104521 18A4104522 18A4104523	**Professional Elective IV** (i) Data Communications (ii) Operating Systems (iii) Analog IC Design	3	-	-	3	40	60	100	3
6	18A4100803	***Indian Constitution (MC)***	2	-	-	2	40	60	100	0
7	18A4104491	Microwave Engineering & OC Lab	-	-	2	2	40	60	100	1
8	18A4104791	Mini Project	-	-	8	8	40	60	100	4
Total			17	2	10	29	320	480	800	22

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	18A4204511 18A4204512 18A4204513	**Professional Elective V (MOOCS)** (i)Wireless Communications and Networks (ii) Soft Computing Techniques (iii) Digital IC Design	3	-	-	3	40	60	100	3
2	18A4204521 18A4204522 18A4204523	**Professional Elective VI (MOOCS)** (i) Computer Networks (ii) Internet of Things and Applications (iii) Artificial Intelligence	3	-	-	3	40	60	100	3
3	18A4204791	Main Project and Seminar	-	-	16	16	80	120	200	8
		Total	**6**	**-**	**16**	**22**	**160**	**240**	**400**	**14**

Head, ECE Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl), Krishna Dist.

2. Verification of Linear Convolution and Circular Convolution of sequences using Code Composer Studio (CCS).

SOFTWARE REQUIRED:

1. MATLAB software

Contribution of Course Outcomes towards achievement of Program Outcomes (POs) and Program Specific outcomes (PSOs) (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2
CO1	3	2	-	2	-	3	-	-	-	-	-	3	-	3
CO2	-	-	-	-	3	-	-	2	-	3	-	-	-	3
CO3	3	3	3	-	-	-	3	-	-	-	2	-	2	-
CO4	2	3	-	-	-	-	-	-	-3	-	-	-	3	-
CO5	2	-	3	2	3	3	-	-	-	-	-	-	-	2
CO6	-	2	-	2	-	-	-	3	-	2	-	-	3	-

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR FINAL YEAR B.TECH PROGRAMME-NRIA 18

IV YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	PC	Microwave Engineering	3	1	-	4	40	60	100	4
2	PC	Optical Communication	3	-	-	3	40	60	100	3
3	PC	Digital Image Processing	3	1	-	4	40	60	100	4
4	PE	**Professional Elective III** (i)Satellite Communications & RADAR Engineering (ii) Data Base Management Systems (iii) Embedded System Design	3	-	-	3	40	60	100	3
5	PE	**Professional Elective IV** (i) Data Communications (ii) Operating Systems (iii) Analog IC Design	3	-	-	3	40	60	100	3
6	MC	***Indian Constitution (MC)***	2	-	-	2	40	60	100	0
7	PC	Microwave Engineering & OC Lab	-	-	2	2	40	60	100	1
8	PR	Mini Project	-	-	8	8	40	60	100	4
Total			**17**	**2**	**10**	**29**	**320**	**480**	**800**	**22**

IV YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	PE	**Professional Elective V (MOOCS)** (i)Wireless Communications and Networks (ii) Soft Computing Techniques (iii) Digital IC Design	3	-	-	3	40	60	100	3
2	PE	**Professional Elective VI (MOOCS)** (i) Computer Networks (ii) Internet of Things and Applications	3	-	-	3	40	60	100	3

		(iii) Artificial Intelligence								
3	**PR**	Main Project and Seminar	-	-	16	16	80	120	200	8
		Total	**6**	**-**	**16**	**22**	**160**	**240**	**400**	**14**

IV Year - I Semester **L T P C**
3 1 0 4

Microwave Engineering

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	4	**External Marks:**	60

Prerequisites: Transmission Lines, Electromagnetic Field Theory

Course Objectives:

- To understand the structure, and function of the various microwave tubes as oscillators and Amplifiers.
- To learn about Microwave solid State Devices as oscillators.
- To analyze fundamental characteristics of Micro strip lines through electromagnetic field concepts.
- To understand the basic properties of waveguide components, Ferrite materials and Microwave Bench Setup for measurement of Microwave parameters.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describe the modes of operation of Klystron tube as microwave Oscillator and amplifier with calculation of efficiency.
CO2	Analyze the modes of operation of Magnetron and TWT as microwave tubes.
CO3	Explore different modes of propagation in waveguide structures using EM field concepts.
CO4	Understand fundamental characteristics of Micro strip lines through electromagnetic field analysis.
CO5	Estimate the S-matrix for various waveguide components and analyze the splitting of the microwave energy in a desired direction.
CO6	Understand the operation of microwave Solid state devices and Measure various microwave parameters using a Microwave test bench.

Course Content(Syllabus)

UNIT I

Part-A: (O type Microwave Tubes-1)

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Microwave tubes –

O type and M type classifications. O-type tubes : Two Cavity Klystron– Structure, Principle of working ,Velocity Modulation Process and Applegate Diagram, Expressions for o/p Power and Efficiency, Applications.

Part-B: (O type Microwave Tubes-2)

Reflex Klystron – Structure, Principle of working, Velocity Modulation Process and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes, Applications.

UNIT II

Part-A: (Microwave Tubes-M type)

M-type Tubes Introduction, Magnetrons – Different Types, 8-Cavity Cylindrical Magnetron, Hull Cut-off Condition, and PI-Mode Operation. Slow Wave Structures-types, Structure of TWT, working of TWT amplifier, Applications.

Part-B: (Microwave Solid State Devices)

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, Characteristics, Basic Modes of Operation. Avalanche Transit Time Devices

– Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

UNIT III

Part-A: (Wave Guides)
Rectangular Waveguides – TE/TM modes, Expressions for Fields, Cut-off Frequencies, Filter Characteristics, Mode Characteristics. Circular Waveguides- Introduction, TE/TM modes, Expressions for Fields, Impossibility of TEM Waves in Hollow Waveguides.

Part-B: (Micro strip Lines)
Introduction to Strip Lines, Basic Structure of Micro strip lines, Z_o Relations, Effective Dielectric Constant, advantages of micro strip lines, losses and applications of micro strip lines.

UNIT IV

Part-A: (Wave Guide Components)
Scattering Matrix– Significance, Formulation and Properties. S-Matrix Calculations for - E-plane and H-plane Tees, Magic Tee, Directional Couplers – 2Hole, Ferrite Components–Faraday Rotation, S-Matrix Calculations for Isolator, Circulator, Related Problems.

Part-B: (Microwave Measurements)
Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method, Measurement of Attenuation, Frequency, Guide Wavelength, VSWR.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994

2.Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi,

REFERENCES:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Engineering - David M. Pozar,Wiley publications,4th Edition
3. Microwave Engineering- Annapurna Das and Sisir K.Das, Mc Graw Hill Education, 3rd Edition.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	3
CO2	2	2	-	2	-	3	-	-	-	-	-	-	2	-
CO3	3	3	-	-	3	-	-	-	3	-	2	-	-	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-	-	3
CO5	2	2	-		-	-	2	-	-	-	-	2	-	-
CO6	-	2	-	2	-	-	-	-	-	2	-	-	-	3

IV Year - I Semester

L	T	P	C
3	0	0	3

OPTICAL COMMUNICATION

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Engineering physics, Analog Communications, Digital Communication.

Course Objectives:

- Analyze and design optical communication and fiber optic sensor systems.
- Understand the properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.
- Analyze the principles of single and multi-mode optical fibers and their characteristics.
- Working of semiconductor lasers, differentiate between direct modulation and external electro-optic modulation. Analyze the operation of LEDs, laser diodes, PIN, photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.
- Design the functionality of each of the components that comprise a fiber optic communication system, the models of analog and digital receivers.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the overview of optical fiber communication and classify the types of optical fibers, analyze cylindrical fibers using mathematical equations.
CO2	Design the optical fibers using various materials and to illustrate various attenuation losses.
CO3	Illustrate various dispersion models Apply splicing techniques on fibers and choose low loss connectors to minimize joint losses.
CO4	Analyze different types of optical sources and photo detectors, External quantum efficiency, and analyze signal transmission, receiver operation and error sources of optical fiber.
CO5	Evaluate the power coupled in to optical fibres and Measurement of Attenuation and Dispersion, Eye pattern.
CO6	Design optical system with budget analysis and to classify principles and types of WDM.

Course Content(Syllabus)

UNIT I

PART A: Overview of optical fiber communication – Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, Cylindrical fibers- Modes, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Related problems.

PART B: Fiber materials – Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. **Fiber losses**-Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses

UNIT II

PART A: Signal distortion in optical fibers - Information capacity determination, Group delay, Types of Dispersion-Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, related problems.

PART B: Optical fiber Connectors-Connector types, Single mode fiber connectors, Connector return loss, **Fiber Splicing**- Splicing techniques, Splicing single mode fibers, **Fiber alignment and**

joint loss- Multimode fiber joints, single mode fiber joints.

UNIT III

PART A: Optical sources - LEDs, Structures, Materials, Internal and External Quantum efficiency, Modulation, Power bandwidth product. **Laser Diodes**- Fabry perot resonator cavity Laser diode, Distributed feedback (DFB) Laser diode, Reliability of LED & ILD

PART B: Optical detectors - Physical principles of PIN and APD, Comparison of Photo detectors. Photo detector Noise, related problems **Optical receiver operation**- Digital signal transmission through optical data link, error sources in optical pulse detection mechanism, Receiver configuration, Digital receiver performance

UNIT IV

PART A: Source to fiber power launching – Source Output pattern, Power coupling calculations, Power launching versus wavelength, Equilibrium Numerical Aperture, Lansing schemes for coupling improvement, Measurement of Attenuation and Dispersion in optical fibers, Eye pattern.

PART B: Optical system design – Point-to- point links- Component choice and considerations, Link power budget with examples, Rise time budget with examples, Line coding in Optical links, Wavelength Division Multiplexing

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCES:

1. Fiber Optic Communications: D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	-	3	-	-	-	-	-	-	2	-	-	3	-	-
CO2	-	2	3	-	-	3	-	-	-	-	2	-	-	3
CO3	3	-	3	-	3	-	3	-	-	3	-	-	-	-
CO4	-	2	-	-	2	-	-	-	-	-	-	-	-	2
CO5	-	-	2	3	-	-	-	2	-	-	-	-	3	-
CO6	2	-	2	3	-	-	-	-	-	2	-	-	-	-

IV Year - I Semester

L	T	P	C
3	1	0	4

DIGITAL IMAGE PROCESSING

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	4	**External Marks:**	60

Prerequisites: Mathematics I & II, Engineering Physics, Linear integrated circuits, Signals and Systems, Analog Communications, Digital Signal Processing.

Course Objectives:

- To introduce the concepts of image processing and basic analytical methods to be used in image processing.
- To familiarize students with image enhancement.
- To introduce different image restoration techniques.
- To introduce the concepts of colour image processing.
- To familiarize the students with image compression techniques.
- To introduce morphological processing and segmentation techniques.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the fundamentals of image processing, necessity for transforms, DFT and its properties, DCT.
CO2	Evaluate techniques for image enhancement.
CO3	Estimate the degradation of an image and apply appropriate restoration techniques.
CO4	Understand the need for colour image processing and learn the fundamentals of colour image processing.
CO5	Understand the need for image compression and learn different techniques to compress image.
CO6	Interpret morphological processing and implement different techniques to segment an image.

Course Content(Syllabus)

UNIT I

PART A: Introduction: Introduction to digital image processing, Fundamental steps in digital image processing, components of an image processing system, Image sensing and acquisition, Representing digital images, Some basic relationships between pixels, An introduction to the mathematical tools used in digital image processing.

PART B: Image transforms and Intensity transformations: Need for transforms, DFT with one variable and two variables, Properties of 2D Discrete Fourier transform, Discrete cosine transform, Basics of intensity transformations and spatial filtering, Some basic intensity transformation functions, Histogram processing.

UNIT II

PART A: Filtering in spatial and frequency domain: Fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters Image smoothing and sharpening using frequency domain filters, Selective filtering in frequency domain filters.

PART B: Image Restoration: A model of the image degradation / Restoration process, Restoration in the presence of noise only Spatial Filtering, Periodic Noise Reduction by

frequency domain filtering, Linear, Position –Invariant Degradations, Estimation the degradation function, Inverse filtering, Minimum mean square error(Wiener) filtering.

UNIT III

PART A: Color image processing: Color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color.

PART B: Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, symbol based coding, Predictive coding , Wavelet coding, color image compression.

UNIT IV

PART A: Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, The Hit or miss transformation, Some basic morphological algorithms, Gray scale morphology, Some basic gray scale morphological algorithms.

PART B: Image segmentation: Fundamentals, point, line, edge detection, Basic edge detection, thresholding, region –based segmentation.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

REFERENCES:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	-	-	3	-	-	-	-	-	-	-
CO2	3	2	-	2	2	-	-	-	-	-	-	-	-	3
CO3	-	3	2	-	-	3	-	-	-	-	-	-	3	-
CO4	3	2	-	3	-	-	-	3	1	-	-	-	-	-
CO5	-	3	2	-	-	-	-	-	-	2	-	-	3	-
CO6	-	2	-	3	2	-	-	-	-	3	-	-	-	-

IV Year - I Semester

L T P C

3 0 0 3

PROFESSIONAL ELECTIVE – III
SATELLITE COMMUNICATIONS & RADAR ENGINEERING

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Digital Communication, Cellular mobile Communication, Optical communication, Signals and Systems, Analog Communications, Electromagnetic Theory, Antennas and Wave Propagation.

Course Objectives:

- To understand the basic concepts, applications, frequencies used and types of satellite communications.
- To analyze various satellite subsystems and their functionality.
- To familiarize with the concepts of satellite link design and calculation of C/N ratio.
- To understand the concepts of satellite navigation, architecture and applications of GPS.
- To gain knowledge about the basics of RADAR and its parameters.
- To learn about different types of Radars and their applications.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the concepts of satellite communications and to analyze the orbital mechanics and launching vehicles.
CO2	Acquire knowledge about various satellite subsystems and basic transmission theory.
CO3	Understand the basic concepts of satellite uplink and downlink design and to analyze the principles of satellite navigation and Global positioning system.
CO4	Acquire the knowledge of Radar system to apply and to design required parameters for a RADAR system and to derive the RADAR Equation.
CO5	Analyze the working principle of CW and Frequency Modulated Radar and their applications.
CO6	Analyze different types of tracking RADARs and to study different types of Radar receivers and displays.

Course Content(Syllabus)

UNIT I

PART A: Introduction: Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

PART B: Orbital Mechanics And Launchers: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II

PART A: Satellite Subsystems: Attitude and orbit control system, telemetry, tracking, Command and Monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space Qualification.

PART B: Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N.

Satellite Navigation and Global positioning system- Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, GPS Navigation Message, GPS signal

levels, GPS receiver operation, Differential GPS.

UNIT III

PART A: Introduction to Radar: Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

PART B: CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, FM-CW Altimeter, Illustrative Problems.

UNIT IV

PART A: Introduction to MTI Radar: Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, **Tracking with Radar**- Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two-coordinates).

PART B: Radar Receivers: Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers.

TEXT BOOKS:

1.Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.

2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications, 2003.

3. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

4. Radar Engineering and fundamentals of Navigational Aids-G.S.N.Raju,I.K International, 2008.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.

2. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

3. Satellite Communication – D.C. Agarwal,Khanna Publications,5th edition.

4. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.

5. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.

6. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	3	-	-	-	-	-	-	-	2	-
CO2	-	3	2	-	-	2	-	-	-	-	-	-	-	-
CO3	3	2	-	3	-	-	-	-	3	-	-	2	-	2
CO4	-	3	-	2	-	-	-	-	-	-	2	-	-	2
CO5	3	2	3	-	-	-	-	-	-	-	-	2	-	-
CO6	2	3	-	-	-	-	2	-	-	-	-	-	-	3

IV Year - I Semester

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE - III

DATABASE MANAGEMENT SYSTEMS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Fundamental knowledge on C, C++, SQL and basic functions of database systems.

Course Objectives:

- To learn the principles of systematically designing and using large scale Database Management Systems for various applications.
- To understand query processing and techniques involved in query optimization.
- To understand the principles of storage structure and recovery management.
- To understand the concepts of transaction management and concurrency control.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describe a relational database and object-oriented database.
CO2	Create, maintain and manipulate a relational database using SQL.
CO3	Describe ER model and normalization for database design.
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.
CO5	Understand the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage.
CO6	Design and build database system for a given real world problem.

UNIT I

PART A: An Overview of Database Management: Introduction- What is Database System- What is Database-Why Database- Data Independence- Relation Systems and Others- Summary.

PART B: Database system architecture, Introduction: The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator- The Database Management Systems- Client/Server Architecture.

UNIT II

PART A: The E/R Models: The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and Er Diagrams-Entities, Attributes, and Entity Sets- Relationship and Relationship Sets-Conceptual Design With the Er Models, The Relational Model Integrity Constraints Over Relations.

PART B: Key Constraints: Foreign Key Constraints-General Constraints, Relational Algebra and Calculus, Relational Algebra- Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus, Tuple Relational Calculus- Domain Relational Calculus.

UNIT III

PART A: Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database.

PART B: Transaction Management and Concurrency Control: Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and

save point, Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler.

UNIT IV

PART A: Concurrency control with locking methods : lock granularity, lock types, two phase Locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering: Wait/Die and Wound/Wait Schemes, Database Recovery management: Transaction recovery.

PART B: Overview of Storages and Indexing: Data on External Storage- File Organization and Indexing –Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree-Based Indexing, Comparison of File Organization.

TEXT BOOKS:

1. Introduction to Database Systems, CJ Date, Pearson.
2. Data base Management Systems, Raghurama Krishnan, Johannes Gherkin, TATA McGraw Hill 3rd Edition
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson

REFERENCE BOOKS:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education.
3. Introduction to Database Systems, C.J.Date Pearson Education.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	2	3	-	-	2	-	-	-	-	-	3	-	-	-
CO3	-	-	3	-	2	-	-	-	3	-	-	-	3	-
CO4	3	-	3	-	-	-	-	2	-	-	-	-	2	-
CO5	3	-	2	-	-	2	-	-	-	-	-	-	-	-
CO6	-	-	3	-	-	-	-	-	-	-	-	2	-	-

IV Year - I Semester

L T P C
3 0 0 3

PROFESSIONAL ELECTIVE - III

EMBEDDED SYSTEM DESIGN

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Operating Systems, Microcontrollers, C Programming.

Course Objectives:

- Provide in-depth knowledge about embedded systems embedded processors, and its hardware and software.
- Explain design metrics or challenges in designing an embedded system.
- Explain real time operating systems, inter task communication and an embedded software development tools.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze the differences between general computing system and the embedded systems, also recognize the classification of embedded systems, core of the embedded systems and need for communication interfaces.
CO2	Understand design approaches of embedded hardware and firmware.
CO3	Know about RTOS, RTOS principles, kernel, tasks, threads, multitasking and multiprocessing.
CO4	Understand kernel objects; inter task communication-pipes, signals, message queues, dead lock, and live lock.
CO5	Apply embedded software development tools, understand unique design problems and challenges of real time systems.
CO6	Understand ARM processor architecture and register organization of ARM.

Course Content(Syllabus)

UNIT I

PART A: INTRODUCTION TO EMBEDDED SYSTEMS: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

PART B: TYPICAL EMBEDDED SYSTEM: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT II

PART A: EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Timer and counting devices, Watchdog timer, Real time clock.

PART B: EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT III

PART A: REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation.

PART B: HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs.

UNIT IV

PART A: Embedded System Development And Testing: The integrated development environment, Types of files generated on cross-compilation, Simulators, Emulators and Debugging, Target hardware debugging, testing on host machine, Embedded Software development process.

PART B: Advanced RISC Machine: Features of ARM, Architecture of ARM, Modes of ARM, Register Organization of ARM, CPSR, Instruction set, Exception handling in ARM, ARM Families.

TEXT BOOKS:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.
3. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.
4. ARM System on Chip Architecture – Steve Furber –2nd Eed., 2000, Addison Wesley Professional

REFERENCES:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lila Beda's-Pearson Publications, 2013

SWAYAM/NPTEL/MOOCS Courses

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://nptel.ac.in/courses/106105193/

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	2	3	-	-	-	-	-	-	-	2	-	-	3	-
CO2	-	-	3	-	2	-	-	3	-	-	-	-	-	3
CO3	2	-	-	3	3	-	1	-	-	-	-	3	-	-
CO4	-	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	-	-	-	-	2	-	-	-	-	-	-	3	-
CO6	-	3	-	2	2	-	-	-	2	-	-	-	-	-

IV Year - I Semester

L	T	P	C
3	0	0	3

PROFESSIONAL ELECTIVE-IV
DATA COMMUNICATIONS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Analog Communication, Digital Communication.

Course Objectives:

- To learn about basics of Data Communication networks, different protocols, standards and layering concepts.
- To know circuits for serial and parallel Data transmission.
- To study about error detection and correction techniques.
- To describe character synchronization and explain the differences between asynchronous and synchronous data formats.
- To understand Data-Link Protocols and Data Communications Networks,
- Define and describe the Congestion Control and Quality of Service in Data communication traffic control.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the concepts of Data Communication networks, different protocols, Standards and layering.
CO2	Analyze open systems interconnection model and various Data Communication circuits.
CO3	Explore the error investigation techniques in data transmission process.
CO4	Demonstrate the character synchronization and explain the differences between asynchronous and synchronous data formats.
CO5	Analyze different Data-Link Protocols and Data Communications Networks.
CO6	Elaborate the Congestion control and Quality of Service in Data traffic control.

Course Content(Syllabus)

UNIT I

Data Communications and Networking:

Part-A: Introduction, Data Communications Network Architecture, Data Communications Protocols, and Standards, Layered Network Architecture, Protocol data unit.

Part-B: Open Systems Interconnection, Data Communications Circuits, Serial and Parallel Data Transmission, Data Communications Circuit Arrangements, Circuit configurations, Transmission modes, Data Communications Networks, components, functions, features, network models.

UNIT II

Fundamental Concepts of Data Communications:

Part-A: Introduction, Error Control, Error Detection, redundancy checking, Error Correction, retransmission, Forward error correction, hamming code, examples.

Part-B: Character Synchronization, Asynchronous serial data, synchronous serial data, Data

Communications Circuits, Data Communications Modems, block diagram, modem classifications, Asynchronous and synchronous voice band modems.

UNIT III

Data-Link Protocols and Data Communications Networks

Part-A: Introduction, Data-Link Protocol Functions, Line discipline, flow control, error control, Character- and Bit-Oriented Data-Link Protocols, Asynchronous Data-Link Protocols, X-modem, Y-modem Synchronous Data-Link Protocols, binary synchronous communications.

Part-B : Synchronous Data-Link Control, Frame format, loop operation, message abort, Invert on zero encoding, High-Level Data-Link Control, subdivisions, information field, elements of procedure.

UNIT IV

Congestion Control and Quality of Service (QoS)

Part-A: Data traffic, congestion, congestion control-open loop and closed loop, congestion control in TCP and congestion control in frame relay.

Part-B: Flow Characterization, Flow Classes, Need For QoS, Techniques to improve QoS, scheduling, traffic shaping, resource reservation and admission control, integrated and differentiated Services.

TEXT BOOKS:

1. Advanced Electronic Communication Systems – W.Tomasi, 6th ed. 2014, PEI.
2. Data Communications and Networking – B.A.Forouzan, 4th ed.2008, TMH.
3. Data Communications and Computer Nerworks – Prakash C.Gupta, 2006, PHI.

REFERENCES:

1 Data and Computer Communications – William Stallings, 8th ed.2007, PHI
2. Computer Networks by Andrew S. Tanenbaum

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	3	-	-	-	2	2	-	-	-	-	-	-
CO3	2	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	2	-	3	-	-	-	-	-	-	-	2	-	-	2
CO5	-	3	2	-	-	2	-	2	-	-	-	-	3	
CO6	3	2	2		-	-	-	-	-	-	-	-	-	3

IV Year - I Semester

L T P C
3 0 0 3

PROFESSIONAL ELECTIVE-IV
OPERATING SYSTEMS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Basic Hardware and Software concepts of Computer Systems and Organization.

Course Objectives:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design various Scheduling algorithms.
CO2	Apply the principles of concurrency.
CO3	Design deadlock, prevention and avoidance algorithms.
CO4	Compare and contrast various memory management schemes.
CO5	Design and Implement a prototype file systems.
CO6	Perform administrative tasks on Servers.

Course Content(Syllabus)

UNIT I

PART A: Introduction to Operating System Concept: Types of operating systems, operating systems Concepts, operating systems services, Introduction to System call, System call types.

PART B: Process Management – Process concept, The process, Process State Diagram , Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Interprocess Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

UNIT II

PART A: Memory Management: Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation.

PART B: Virtual Memory Management:
Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

UNIT III

PART A: Concurrency: Process Synchronization, The Critical- Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples.

PART B: Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention,
Detection and Avoidance, Recovery form Deadlock

UNIT IV

PART A: File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

PART B: File System implementation- File system structure, allocation methods, free-space management

Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers.

TEXT BOOKS:

1.Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.

3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

REFERENCES:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.

3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata Mc Graw-Hill Education, 2007.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	2	-	-	2	-	-	-	-	-	-	-	2
CO3	2	-	-	3	-	-	-	-	-	-	-	2	-	-
CO4	-	2	-	2	-3	-	-	-	-	-	-	-	-	-
CO5	2	-	3	-	-	-	-	-	-	-	-	2	3	-
CO6	-	3	2	-	-	-	-	-	-	-	-	-	-	-

IV Year - I Semester

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3 0 0 3

PROFESSIONAL ELECTIVE-IV
ANALOG IC DESIGN

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Electronic Devices and circuits, Linear IC Applications.

Course Objectives:

Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.

Study CMOS Amplifiers like Differential Amplifiers, Cascade Amplifiers, Output Amplifiers, and Operational Amplifiers.

Design and to develop the Analog CMOS Circuits for different Analog operations.

Understand the concepts of Sample and Hold circuits and Open-Loop Comparators.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the knowledge of MOS devices and modeling.
CO2	Use different styles of CMOS Circuit modelling to synthesize analog ICs.
CO3	Apply appropriate biasing techniques to improve performance of analog circuits.
CO4	Design and Develop Analog Integrated Circuits using MOS Transistor.
CO5	Design and Develop CMOS Op Amps.
CO6	Assess the performance of sample and hold circuits and comparators in analog ICs suitable for societal use.

Course Content(Syllabus)

UNIT I

PART A: Basic MOS Devices: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, Latch up in CMOS Technology, Short Channel Effects in MOS Transistors.

PART B: CMOS Device Modelling: Weak Inversion in MOS Transistors Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

UNIT II

PART A: Current Mirrors: Current Sinks and Sources, Simple Current Mirrors, Simple Current Mirror with Source Degeneration, Cascode Current Mirror and Wilson Current Mirror.

PART B: Biasing Techniques: CS Biasing, CG Biasing, Source Follower Biasing, Differential Pair Biasing.

UNIT III

PART A: Single Stage Amplifiers: Common Source Stage with resistive load, Source follower, Common Gate Stage, Cascode Stage.

PART B: CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT IV

PART A: Sample and Hold Circuits:

Performance of Sample and Hold Circuits, MOS Sample and Hold Basics, Examples of CMOS S/H circuits, Bipolar and BICMOS Sample and Hold circuits.

PART B:Comparators:

Using an Opamp for a Comparator, Charge-Injection Errors, Latched Comparators, Examples of CMOS and BiCMOS Comparators.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits, Behzad Razavi, Tata McGraw Hill, 2nd Edition, 2008.

2.Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn, 2013.

REFERENCES:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

2.CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	-	-	-	2	-	-	2	-	-	-	-	3	-
CO2	-	-	2	-	3	-	3	-	-	-	-	3	-	3
CO3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO4	-	-	3	3	-	-	-	-	3	-	-	-	-	-
CO5	-	2	-	-	3	-	-	-	-	2	-	-	-	-
CO6	3	2	-	-	-	3	-	-	-	-	-	3	-	-

IV Year - I Semester

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MANDATORY COURSE
INDIAN CONSTITUTION

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	0	**External Marks:**	60

Prerequisites: Civics, Basics of Political Science.

Course Objectives:

- Understand the importance of constitution.
- Understand the structure of executive, legislature and judiciary.
- Understand philosophy of fundamental rights and duties.
- Understand the central and state relations, financial and administrative duties.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the meaning, history, features and characteristics of Indian Constitution.
CO2	Gain knowledge on fundamental rights duties and Principles and importance of State Policy.
CO3	Understand the powers of Union, the States and Indian President.
CO4	Know about amendments of the constitution and Emergency Provisions.
CO5	Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO6	Analyze the decentralization of power between central, state and local self-government.

Course Content(Syllabus)

UNIT I

Meaning of the constitution law and constitutionalism, Historical perspective of the constitution of India, Salient features and characteristics of the constitution of India.

UNIT II

Fundamental Rights under Indian constitution, scheme of the fundamental Rights, Scheme of the fundamental Right to Equality, Scheme of the fundamental Right to certain freedoms under Article 19 Scope of the right to life and personal Liberty under Article 21.

UNIT III

Federal structure and distribution of legislative and financial powers between the union and the states, Parliamentary form of government in India-the constitution powers and status of the President of India, Amendment of the constitutional powers and procedure, The historical perspectives of the constitutional amendments in India, Local self government-Constitutional Scheme in India.

UNIT IV

Emergency Provisions, National Emergency, President Rule, Financial Emergency
Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women.

TEXT BOOKS:

1.The Constitution of Indial, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, —*Framing of Indian Constitution*‖, 1st Edition, 2015.

REFERENCES:

1.M. P. Jain, —*Indian Constitution Law*, 7th Edition., Lexis Nexis, 2014.
2.D.D. Basu, —*Introduction to the Constitution of India*, Lexis Nexis, 2015.
3. SubhashKashyap, Our Parliament, National Book Trust, New Delhi
4. Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi
5. B.Z. Fadia&KuldeepFadia, Indian Government &Politics, Lexis Nexis, New Delhi

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	-	-	3-	-	-	-	-	-	-	-	-
CO2		3	2	-	-	-	-	2	-	-	-	-	-	-
CO3	3	-	2	-	-	-	3	-	3	-	-	2	-	-
CO4	-	-	3	-	-	-	-	2	-	-	-	2	-	-
CO5		2	-	3	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-		-	-

IV Year - I Semester

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Microwave Engineering and Optical Communication lab

Minimum 10 experiments should be conducted.
{ 6 experiments from part A and 4 experiments from part B}

Pre-Requisites: Analog Communication and Digital Communication.

Course Outcomes: The Students will be able to

- Verify characteristics of various microwave sources by conducting experiments with microwave bench setup.
- Analyze various parameters of Waveguide Components by conducting experiments with microwave bench setup.
- Estimate the power measurements of RF Components such as directional Couplers and circulators.
- Demonstrate characteristics of various optical sources by conducting experiments.
- Analyze the characteristics of optical fiber by conducting experiments and measuring various parameters.
- To demonstrate the Working of various Microwave Devices and components through microwave bench setup.

Part-A

Microwave Communications (Any Six Experiments)

1. Characteristics of the Reflex Klystron Tube
2. Characteristics of Gunn Diode
3. Determination of Voltage Standing Wave Ratio (VSWR)
4. Waveguide Parameters Measurement
5. Attenuation Measurement
6. Characteristics of Multihole Directional Coupler
7. Scattering Parameters of Circulator
8. Scattering Parameters of Magic Tee

Part-B

Optical Communications (Any Four Experiments)

1. V-I Characteristics of LED
2. Characteristics of Laser Diode

3. Measurement of Numerical Aperture of Optical fiber

4. Measurement of Losses in Analog Optical Link

5. Measurement of Data Rate Using Digital Optical Link

Equipment required for Laboratories:

1. Klystron Power Supply
2. Gunn Power Supply
3. VSWR Meter
4. Reflex klystron Tube
5. Gunn Diode
6. PIN diode
7. Waveguide Components
8. Microwave Bench setup with klystron Tube
9. Microwave Bench setup with Gunn diode
10. Optical Fibre Link Setup with LED
11. Optical Fibre Link Setup with LASER diode
12. CRO - 0 – 30 M Hz.

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AUTONOMOUS SYLLABUS

IV - II

IV Year - II Semester

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PROFESSIONAL ELECTIVE-V
WIRELESS COMMUNICATIONS AND NETWORKS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Antennas and Wave Propagation, Cellular Mobile communication, Analog Communication, Digital Communication.

Course Objectives:

- To understand the functions of wireless communication system and evolution of different wireless communication systems and standards.
- To be able to compare recent technologies used for wireless communication.
- To analyze and be able to explain the architecture, functioning, protocols, capabilities and applications of various wireless communication networks.
- To understand the concepts and be able to explain multiple access techniques for Wireless Communication.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the functioning of wireless communication system and evolution of different wireless communication systems and standards.
CO2	Compare different technologies used for wireless communication systems.
CO3	Explore the architecture, functioning, protocols, capabilities and application of various wireless communication networks.
CO4	Analyze various multiple access techniques for Wireless Communication.
CO5	Evaluate design challenges, constraints and security issues associated with wireless networks.
CO6	Acquire knowledge about various wireless data services and their performance.

Course Content(Syllabus)

UNIT I

PART A: Mobile Radio Propagation: Large-Scale Path Loss:
Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, Basic Propagation Mechanisms, **Reflection**: Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, **Diffraction**: Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering.
PART B: Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, **Indoor Propagation Models-** Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model.

UNIT II

PART A:Mobile Radio Propagation: Small –Scale Fading and Multipath
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel, **Small-Scale Multipath Measurements**-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, **Parameters of Mobile Multipath Channels**-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.
PART B:Types of Small- Scale Fading- Fading effects Due to Multipath Time Delay Spread, Flat fading and Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow-

fading, **Statistical Models for multipath Fading Channels**-Clarke"s model for flat fading, spectral shape due to Doppler spread in Clarke"s model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT III

PART A: Equalization and Diversity-Introduction, Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer.

PART B: Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. **Diversity** -Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, **Practical Space Diversity Consideration**-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT IV

PART A: Wireless Networking. Introduction to Wireless Networks. Differences Between Wireless and Fixed Telephone Networks. Development of Wireless Networks. Fixed Network Transmission Hierarchy. Traffic Routing in Wireless Networks.

PART B: Wireless Data Services: Common Channel Signaling (CCS). Integrated Services Digital Network (ISDN). Signaling System No. 7 (SS7). Network Service part (NSP) of SS7,The SS7 user parts, Signaling Traffic in SS7, SS7 services, Performance of SS7.

TEXT BOOKS:

1 Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCES:

1. Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.
3. Wireless Communication and Networking – William Stallings, 2003, PHI.
4. Wireless Communication – UpenDalal, Oxford Univ. Press.
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	3	-	2	-	-	-	-	-	-	-	-	-	3
CO2	3	-	-	-	3	-	3	-	-	3	-	-	-	2
CO3	3	3	-	-	-	-	-	3	-	-	-	-	3	-
CO4	-	-	3	-	3	-	-	-		-	-	2	-	-
CO5	3	2	2	-	3	-	-	-	-	-	-	-	-	3
CO6	-	2	-	-	-	2	-	-	-	-	2	-	-	-

IV Year - II Semester

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PROFESSIONAL ELECTIVE-V
SOFT COMPUTING TECHNIQUES

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Electronic Devices and circuits, Linear IC Applications.

Course Objectives:

- To provide an introduction to the basic principles, techniques, and applications of soft computing.
- To understand the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.
- To develop some familiarity with current research problems and research methods in Soft Computing by working on a research or design project.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand human intelligence and artificial intelligence.
CO2	Know how intelligent system works.
CO3	Apply basics of Fuzzy logic and neural networks.
CO4	Analyze the fuzzy sets, fuzzy logic and use of heuristics based on human experience.
CO5	Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.
CO6	Understand genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

Course Content(Syllabus)

UNIT I

Part-A (Introduction to Soft Computing): What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

Part-B: various types of soft computing techniques, Fuzzy Computing, Neural Computing Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Classification, Probabilistic reasoning.

UNIT II

Part-A (Fundamentals of Artificial Neural Network):

What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons , Back Propagation networks, Architecture of Back propagation(BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory.

Part-B: Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Deep learning, Taxonomy of ANN Systems, Single- Layer ANN System, Supervised Learning Neural Networks, Perceptrons, Adaline, Mutilayer Perceptrons Applications of ANN in research.

UNIT III

Part-A (.Fuzzy Set Theory & Fuzzy Systems) :

Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, introduction & features of membership functions, Extension Principle, Fuzzy If-Then Rules, Sugeno Fuzzy Models, Fuzzification, Defuzzification, Applications.

Part-B: (Fuzzy Logic) : Fuzzy Sets – Properties – Membership Functions – Fuzzy Operations. Fuzzy Logic and Fuzzy Inference System

UNIT IV

Part-A(Genetic Algorithms and Hybrid Systems) :

Fundamentals of Genetic Algorithms, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling,

Part-B: Hybrid Systems: Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms, Research orientation of soft computing techniques.

TEXT BOOKS:

1 J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

2. Simon O. Haykin "Artificial Neural Network", PHI, 2003

3. Elaine Rich, Kevin Knight, Artificial Intelligence TMH, 2009

REFERENCES:

1 Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.

2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.

4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence – PC Tools", AP Professional, Boston, 1996.

5. Dan W. Patterson, Introduction to AI and Expert System, PHI, 2009.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	-	2	-	3	-	-	-	-	-	-	2	-	-
CO2	-	3		2	-	-	-	2	-	-	-	-	-	3
CO3	2	3	-	3	-	3	-	-	-	-	-	-	-	-
CO4	2	-	3	3	-	-	-	-	2	-	2	-	-	2
CO5	2	3	-	-	-	-	-	2	-	-	-	-	3	-
CO6	-	3	2	-	-	-	-	-	-	3	-	-	-	-

IV Year – II Semester

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3 0 0 3

PROFESSIONAL ELECTIVE-V
DIGITAL IC DESIGN

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Electronic Devices and circuits, Linear IC Applications.

Course Objectives:

- Understand the behavior of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- Study CMOS Amplifiers like Differential Amplifiers, Cascade Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Design and to develop the Analog CMOS Circuits for different Analog operations.
- Understand the concepts of Sample and Hold circuits and Open-Loop Comparators.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the knowledge of MOS devices and modeling.
CO2	Use different styles of CMOS Circuit odeling to synthesize analog Ics.
CO3	Apply appropriate biasing techniques to improve performance of analog circuits.
CO4	Design and Develop Analog Integrated Circuits using MOS Transistor.
CO5	Design and Develop CMOS Op Amps.
CO6	Assess the performance of sample and hold circuits and comparators in analog Ics suitable for societal use.

Course Content(Syllabus)

UNIT I

PART A: Basic MOS Devices: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, Latch up in CMOS Technology, Short Channel Effects in MOS Transistors.

PART B: CMOS Device Modelling: Weak Inversion in MOS Transistors Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Sub-threshold MOS Model.

UNIT II

PART-A: Current Mirrors: Current Sinks and Sources, Simple Current Mirrors, Simple Current Mirror with Source Degeneration, Cascode Current Mirror and Wilson Current Mirror.

PART B: Biasing Techniques: CS Biasing, CG Biasing, Source Follower Biasing, Differential Pair Biasing.

UNIT III

PART A: Single Stage Amplifiers: Common Source Stage with resistive load, Source follower, Common Gate Stage, Cascode Stage.

PART B: CMOS Operational Amplifiers: Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

UNIT IV

PART A: Sample and Hold Circuits:

Performance of Sample and Hold Circuits, MOS Sample and Hold Basics, Examples of CMOS S/H circuits, Bipolar and BICMOS Sample and Hold circuits.

PART B: Comparators:

Using an Opamp for a Comparator, Charge-Injection Errors, Latched Comparators, Examples of CMOS and BiCMOS Comparators.

TEXT BOOKS:

1. Design of Analog CMOS Integrated Circuits, Behzad Razavi, Tata McGraw Hill, 2nd Edition, 2008.

2.Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn, 2013.

REFERENCES:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

2.CMOS Analog Circuit Design – Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	3	-	-	2	-	-	-	-	-	2	-	-	2
CO2	3	3	-	-		-	-	-	-	-	-	3	3	-
CO3	3	3	-	-	-	-	2	-	-	3	-	-	-	-
CO4	-	-	3	3	3	-	-	-	2	-	-	-	3	-
CO5	3	2	-	-	3	-	-	-	-	-	-	-	3	-
CO6	3	2	-	-	-	3	-	3	-	-	-	3	-	-

IV Year – II Semester

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PROFESSIONAL ELECTIVE-VI
COMPUTER NETWORKS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Basic concepts of networks, Analog Communication, Digital Communication.

Course Objectives:

- Understand the layered communication architectures (OSI and TCP/IP).
- Understand various network topologies required for communications.
- Demonstrate the Functions of various protocols of Data link layer and understand the basics of error detection including parity, checksums, and CRC.
- Demonstrate Functioning of various Routing protocols.
- Analyze the Functions of various Transport layer protocols.
- Understand the significance of application layer protocols.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Acquire knowledge about different network models like OSI and TCP/IP and various network topologies like WAN, LAN and MAN.
CO2	Distinguish different modes of wired transmission media such as copper wire, twisted pair wire, OFC and wireless transmission media.
CO3	Analyze various error detection techniques and functions of various protocols of Data link layer.
CO4	Analyze MAC layer protocols and LAN technologies.
CO5	Design different routing protocols and acquire knowledge on significance of various Flow control and Congestion control Mechanisms.
CO6	Acquire Knowledge on functioning of various Application layer Protocols.

Course Content(Syllabus)

UNIT I

PART A: Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

PART B: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

UNIT II

PART A: The Data Link Layer – Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat.

PART B: The Medium Access Control Sublayer -The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Multiple Access Protocols- Collision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols.

UNIT III

PART A: The Network Layer - Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks

PART B: Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing-Admission Control-Traffic Throttling-Load Shedding.

UNIT IV

PART A: Transport Layer: Introduction and Transport Layer Services : Relationship Between Transport and Network Layers, Overview of the Transport Layer in the Internet, Multiplexing and De-multiplexing.

PART B: Connectionless Transport: UDP -UDP Segment Structure, UDP Checksum, Principles of Reliable Data Transfer-Building a Reliable Data Transfer Protocol, Pipelined Reliable Data Transfer Protocols, Go-Back-N(GBN), Selective Repeat(SR),**Connection Oriented Transport:** TCP - The TCP Connection, TCP Segment Structure. **Application Layer:** The DNS, Electronic Mail , FTP Commands and Replies

TEXT BOOKS:

1.Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010

2.Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education

REFERENCES:

1.Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5th ed), Morgan Kaufmann/ Elsevier, 2011

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	-	2	-	-	-	-	-	-	-	3	3	-
CO2	2	-	2	-	1	-	-	-	3	-	-	-	-	-
CO3	3	2	-	2	-	3	-	-	-	-	-	-	-	2
CO4	2	-	1	-	-	-	-	2	-	-	2	-	3	-
CO5	-	2	2	-	2	-	2	-	-	-	-	-	-	-
CO6	3	-	2	-	2	-	-	-	-	2	-	2	-	2

IV Year - II Semester

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3 0 0 3

PROFESSIONAL ELECTIVE-VI
INTERNET OF THINGS AND APPLICATIONS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Embedded Systems, Microcontrollers, Operating Systems.

Course Objectives:

- To Understand Smart Objects and IoT architecture.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To acquaint with the various security concepts in IoT architecture.
- To build simple IOT system using Arduino and Raspberry PI platform.
- To understand data analytics and cloud in the context of IOT.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Summarize on the term 'internet of things' in different contexts and to analyze various protocols for IoT.
CO2	Comprehend and analyze Software defined networks.
CO3	Explore IT Access Technologies and security for IEEE 802.15.4, 802.15.4g, 802.15.4e, 802.11ah and Lora WAN.
CO4	Explore and learn about Internet of Things with the help of preparing projects designed using Arduino and Raspberry Pi.
CO5	Apply data analytics and use cloud offerings related to design and develop a solution for a given application using APIs and test for errors in the application.
CO6	Implement real field problem by gained knowledge of Industrial applications with IoT capability.

Course Content(Syllabus)

UNIT I

PART A: INTRODUCTION TO INTERNET OF THINGS:

Definition and characteristics of IOT, Evolution of IOT, Logical view of IOT ecosystem, Functional blocks of IOT: Sensors, Actuators, Smart Objects and connecting smart objects, Physical design of IOT-IOT Protocols, IOT Communication models, Calm and Ambient Technologies.

PART B:FUNDAMENTALS OF IOT:

The Internet of Things: An overview, The Flavor of the IOT, Design principles for connected devices, IOT Architectures, OneM2M, IOT World Forum (IoTWF) and alternative IOT Models.

UNIT II

PART A: IOT and M2M:

Software defined networks, Network Function Virtualization, Difference between SDN and NFV for IOT, Basics of IOT system management with NETCONF, YANG-NETCONF, YANG, and NETOPEER.

PART B: IOT PRINCIPLES & IOT COMMUNNICATION ARCHITECTURE:

IOT nodes, IOT Edges, 6 LOWPAN, Optimizing IP for IOT: IP, TCP, The IP Protocol suite (TCP/IP), UDP, IP Address, Static IP Address Assignment, Dynamic IP Address Assignment, IPV4 & IPV6.

UNIT III

PART A: IOT PROTOCOLS:

IT Access Technologies: Physical and MAC Layer, Topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 802.11ah and Lora WAN.

PART B: IOT PHYSICAL DEVICES & END POINTS:

Embedded Computing basics, Microcontrollers, System-On-Chip, IOT system building blocks, Arduino, Raspberry PI – Installation, Interfaces (Serial, SPI, I2C).

UNIT IV

PART A: IOT PHYSICAL SERVERS AND CLOUD OFFERINGS:

Introduction to Cloud Storage models and Communication API Servers- Web Server for IOT , Cloud for IOT, Getting started with an API, Mashing up API, Scraping, Legalities, Writing a New API, Application Layer Protocols: MQTT, COAP, Extensible Messaging and presence protocol (xmpp).

PART B: INTRODUCTION TO INDUSTRY 4.0 AND II0T:

Defining Industry 4.0, Characteristics of Industry 4.0, and Benefits to Business, Industry 4.0 Design Principles, Building blocks of Industry 4.0, Industry 4.0 Reference Architecture, and Smart Factories. Concept of 5G Technology: A New Step to IOT Platform. Case study/ Industrial Application.

TEXT BOOKS:

1 Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012.

2. Internet of Things - A Hands-on Approach, ArshdeepBahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547.

3.The Internet of Things – Key applications and Protocols, Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012.

4. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017.

5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

6. Industry 4.0; The Industrial Internet of Things, Alasdair Gilchrist.

REFERENCES:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan.

2. Internet of Things Architecture Final Architectural Reference Model for the IoT v3.0, http://www.iot-a.eu/public.

3. From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle and Elsevier.

4. The Internet of Things, Enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	-	-	-	2	3	-	-	3	-	2	2	3	-
CO2	-	2	-	3	-	-	-	-	2	-	-	-	-	3
CO3	-	3	2	-	-	1	-	2	-	3	3	2	2	-
CO4	3	-	-	3	-	-	-	-	3	-	-	3	-	-
CO5	-	2	-	-	-	-	-	-	2	-	2	-	-	3
CO6	-	-	2	-	2	-	2	-	-	2	-	2	-	-

IV Year - II Semester

L T P C
3 0 0 3

PROFESSIONAL ELECTIVE-VI
ARTIFICIAL INTELLIGENCE

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Data Structures, Algorithms and Probability

Course Objectives:

- To learn the difference between optimal reasoning vs human like reasoning.
- To understand the notions of state space representation, exhaustive search, heuristic search alongwith the time and space complexities.
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems,Machine Learning and Natural Language Processing

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Formulate an efficient problem space for a problem expressed in English.
CO2	Identify a search algorithm for a problem and characterize its time and spacecomplexities.
CO3	Acquire skills for representing knowledge using the appropriate technique.
CO4	Apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.
CO5	Apply the knowledge to develop the solutions for real life problems.
CO6	Develop new algorithms to contribute to the research arena.

Course Content(Syllabus)

UNIT I

PART A: Introduction: History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications.

PART B: Problem Solving: State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction.

UNIT II

PART A: Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming.

PART B: Representing Knowledge Using Rules: Logic programming, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning, Matching, Control Knowledge.

UNIT III

PART A: Knowledge Representation: Introduction, Approaches to Knowledge Representation, KnowledgeRepresentation using Semantic Network, Extended Semantic Networks for KR.

PART B: Knowledge Representation using Frames: Conceptual dependencies, Scripts.

UNIT IV

PART A: Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems.

PART B: Fuzzy Logic: Crisp Sets, Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world.

AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog.

TEXT BOOKS:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mc graw-Hill Publications.

2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications.

REFERENCES:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2.Artificial Intelligence : A modern Approach, Russell and Norvig, Printice Hall
3.Artificial Intelligence, Robert Schalkoff, Mcgraw-Hill Publications
4.Artificial Intelligence and Machine Learning, Vinod Chandra S.S., Anand Hareendran S.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	2	2	-	-	-	-	3	-	-	-	-	-	-
CO2	-	2	2	1	-	3	-	-	-	-	-	-	3	-
CO3	3	-		-	1	-	3	-	-	3	-	-	-	-
CO4	-	2	3	-	-	-	-	-	-	-	-	-	3	2
CO5	3	-	2	-	2	-	-	-	-	3	2	-	-	-
CO6	-	2	3	1	-	-	-	-	1	-	-	-	3	1

NRI INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME
II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Max Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	BS 20A2100202	Mathematics-III	3	-	-	3	30	70	100	3
2	PC 20A2104403	Signals and Systems	3	-	-	3	30	70	100	3
3	PC 20A2104401	Electronic Devices and circuits	3	-	-	3	30	70	100	3
4	PC 20A2104402	Switching Theory and Logic Design	3	-	-	3	30	70	100	3
5	PC 20A2104404	Random Variables and Stochastic Processes	3	-	-	3	30	70	100	3
6	PC LAB 20A2104493	Basic Simulation Lab	-	-	3	3	15	35	50	1.5
7	PC LAB 20A2104491	Electronic Devices and circuits Lab	-	-	3	3	15	35	50	1.5
8	PC LAB 20A2104492	Switching Theory and Logic Design Lab	-	-	3	3	15	35	50	1.5
9	SC* 20A2104991	Electronic Circuit Design	1	-	2	3	-	50	50	2
10	MC 20A2100801	Indian Constitution	2	-	-		30	70	100	0
		Total	**18**	**0**	**11**	**29**	**225**	**575**	**800**	**21.5**

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NR1A20

II Year - I Semester

L T P C
1 0 2 2

Electronic Circuit Design
(Skill Course)

Lecture – Practical:	1-2 Hours	**Internal Marks:**	0
Credits:	2	**External Marks:**	50

Prerequisites: Fundamentals of Electronics.

Course Objectives:

- To familiarize the electronic circuit rules and its parameter calculations.
- To make familiar with PCB design and various processes involved.
- To provide in-depth core knowledge in the fabrication of Printed Circuit Boards.
- To provide the knowledge in assembling and testing of the PCB based electronic circuits.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze the electronic circuit rules and its parameter calculations.
CO2	Develop the simulation process in the design of Electronic Circuits.
CO3	Interpret the PCB design and various processes involved
CO4	Explore in-depth core knowledge in the and fabrication of Printed Circuit Boards
CO5	Apply assembling and testing of the PCB based electronic circuits
CO6	Design single side PCB for power supplies of various devices.

Course Content(Syllabus)

UNIT I

Fundamentals of Circuit Design:

Basic circuit laws, Current & voltage division Rules, Introduction to Linear and Non-linear elements, Equivalent Impedance Calculations in series & parallel circuits, Current, voltage and Power calculations in a circuit, Classification of sources.

UNIT II

Schematic Capture Tools :

Introduction to schematic capture tools, Simulation of simple electronic circuits, Schematic to layout transfer, Layout Printing.

UNIT III

PCB Design Process :

Conception Level Introduction: Specifying Parts, Packages and Pin Names, Libraries and Checking foot prints of the components, Partlist, Netlist, Making Netlist Files, Placing Parts, Routing Traces, Modifying Traces, Mounting Holes, Adding Text, PCB Layout.

UNIT IV

PCB Fabrication Process :

Classification of Printed Circuit Boards (SSB, DSB and multilayer board), PCB manufacturing machines, ultraviolet exposure and developing Copper clad preparation, Etching, cleaning, drying and drilling.

UNIT V

Power Supply design:

Introduction to low power design techniques and methodologies. Introduction to various types of power supplies. Estimation of power supply requirements and power loss in electronic products. Selection of appropriate power supplies for the given primary power sources (230VAC/Battery/SMPS).

TEXT BOOKS:

1. Printed Circuit Boards: Design, Fabrication, and Assembly (McGraw-Hill Electronic Engineering) by Raghbir Singh Khandpur.
2. Printed Circuits Handbook" by Clyde F Coombs and Happy Holden.

REFERENCES:

PCB Design/TINA/ORCAD.PADS software User manuals.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2
CO1	3	3	-	-	-	-	-	-	-	-	3	-	3	2
CO2	-	3	-	-	-	3	-	-	3	-	-	3	2	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-	-	3
CO4	2	-	-	-	3	-	-	-	-	2	-	-	3	2
CO5	-	3	2	-	-	-	-	-	3	-	3	-	2	-
CO6	-	-	3	2	-	3	-	-	-	3	-	-	-	3

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME
II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Max Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	ES 20A2204301	Linear Control Systems	3	-	-	3	30	70	100	3
2	PC 20A2204402	Analog Communications	3	-	-	3	30	70	100	3
3	PC 20A2204401	Analog and Pulse Circuits	3	-	-	3	30	70	100	3
4	PC 20A2204403	Electromagnetic Waves and Transmission Lines	3	-	-	3	30	70	100	3
5	HS 20A2200101	Managerial Economics and Financial Analysis	3	-	-	3	30	70	100	3
6	PC LAB 20A2204492	Analog Communications Lab	-	-	3	3	15	35	50	1.5
7	PC LAB 20A2204491	Analog and Pulse Circuits Lab	-	-	3	3	15	35	50	1.5
8	PC LAB 20A2204493	VHDL Programming Lab	-	-	3	3	15	35	50	1.5
9	SC* 20A2204991	Python Programming	1	-	2	3	-	50	50	2
		Total	**16**	**0**	**11**	**27**	**195**	**505**	**700**	**21.5**

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NR1A20

II Year - II Semester

L T P C
1 0 2 2

PYTHON PROGRAMMING
(Skill Course)

Lecture – Practice:	1-2 Hours	**Internal Marks:**	0
Credits:	2	**External Marks:**	50

Prerequisites: Adequate exposure to Programming ,A basic understanding on various computer concepts , C programming basic syntax

Course Objectives:

- To understand the PYTHON environment and make numerical computations and analysis.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Know comprehensions, generators in python.
CO2	Understand the exception handling in python
CO3	Know the usage of file I/O
CO4	Understand various data types like lists, tuples, strings etc
CO5	Know the usage of various pre-defined functions on the above data types

Course Content(Syllabus)

Exercises

1. a. Write a program to get the list of even numbers upto a given number.

b. Write a program to get the ASCII distance between two characters.

c. Write a program to get the binary form of a given number.

d. Write a program to convert base 36 to octal.

2. a. Write a program to get the number of vowels in the input string (No control flow allowed)

b. Write a program to check whether a given number has even number of 1's in its binary representation (No control flow, the number can be in any base)

c. Write a program to sort given list of strings in the order of their vowel counts.

3. a. Write a program to return the top 'n' most frequently occurring chars and their respective counts. E.g. aaaaaabbbbcccc, 2 should return [(a5) (b 4)]

b. Write a program to convert a given number into a given base.

Note: Convert the given number into a string in the given base. Valid base is 2<=base <=36 Raise exceptions similar to how int ("XX", YY) does (play in the console to find what errors it raises). Handle negative numbers just like bin and oct do.

4. a. Write a program to convert a given iterable into a list. (Using iterator)

b. Write a program to implement user defined map() function.

Note: This function implements a map. It goes through the iterable and applies funcon each of the elements and returns a list of results. Don't use a for loop or the built-in map function. Use exceptions, while loop and iter.

c. Write a program to generate an infinite number of even numbers (Use generator) d. Write a

program to get a list of even numbers from a given list of numbers. (use only comprehensions)

5. Write a program to implement round robin.

Note: This routine to take a variable number of sequences and return elements from them in round robin till each sequence is exhausted. I fone of the input sequences is infinite, this is also infinite. e.g if input is [1,2,3], (4,5) -> yield 1,4,2,5,3 one after the other. Use exception control and comprehensions to write elegant code. Hint: This requires you to use understand variable arguments, lists, list copy, comprehensions, iterators, generators, exception handling, control flow etc.

6. a. Write a program to sort words in a file and put them in another file. The output file should have only lower case words, so any upper case words from source must be lowered. (Handle exceptions)

b. Write a program return a list in which the duplicates are removed and the items are sorted from a given input list of strings.

7. a. Write a program to test whether given strings are anagrams are not.

b. Write a program to implement left binary search.

Note: Left binary search returns the left most element when a search key repeats. Fore.gif input is [1,2,3,3,4,4,5] and I search 3, it should return 2 as index 2 is the left most occurrence of 3.

8. a. write a class Person with attributes name, age, weight (kgs), height (ft) and takes them through the constructor and exposes a method get_bmi_result() which returns one of "underweight", "healthy", "obese"

b. Write a program to convert the passed in positive integer number into its prime factorization form.

Note: If number = a1 ^ p1 * a2 ^ p2 ... where a1, a2 are primes and p1, p2 are powers >=1 then were present that using lists and tuples in pythonas [(a1,p1),(a2,p2), ...] e.g.[(2,1),(5,1)] is the correct prime factorization of 10

TEXT BOOKS:

1.Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

3.Mark Lutz & David Ascher, "Learning Python", Oreilly Publications, 5th edition

REFERENCE BOOKS:

1. Think Python , Allen Downey , Green Tea Press

E-RESOURCES:

1. https://www.tutorialspoint.com/python/
2. https://docs.python.org/3/tutorial/
3. https://www.w3schools.com/python/
4. https://www.javatpoint.com/python-tutorial

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Transform Techniques and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2105401	Python Programming	3	0	0	3	30	70	100	3
3	20A2105402	Data Base Management Systems	3	0	0	3	30	70	100	3
4	20A2105403	Computer Organization and Architecture	3	0	0	3	30	70	100	3
5	20A2105404	Internet of Things	3	0	0	3	30	70	100	3
6	20A2105491	Python programming Lab	0	0	3	3	15	35	50	1.5
7	20A2105492	Data Base Management System Lab	0	0	3	3	15	35	50	1.5
8	20A2105493	Internet of Things Lab	0	0	3	3	15	35	50	1.5
9	SOC	Web Application Development Using Full Stack – Frontend Development – Module - I	0	0	4	4	15	35	50	2
10	20A2105901	Aptitude and Reasoning	0	2	0	2	15	35	50*	0
Total			15	2	13	30	225	525	750	21.5

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III SEMESTER

Course Code-Python Programming

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

'equate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

Course Objectives:

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries.

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

Course Outcomes:

on successful completion of the course, the student will be able to:

CO1	Experience with an interpreted Language and to build software for real needs
CO2	Use basic Decision structures, Boolean logic, variable types, assignments and operators.
CO3	Describe and use of Python lists, dictionaries, tuples and sets.
CO4	Implement methods and functions to improve readability of programs
CO5	Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO	PO 12	PSO1	PSO2	PS 3

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CO1	3	--	--	--	3	--	--	--	3	--	3	--	3	3	--
CO2	--	3	2	--	--	--	--	--	--	--	--	--	2	3	2
CO3	--	--	--	2	3	--	--	--	3	--	--	--	3	3	--
CO4	--	--	--	3	3	--	--	--	3	--	--	--	2	3	--
CO5	--	--	--	3	--	--	--	--	--	--	3	--	3	3	3

UNIT I : DATA, EXPRESSIONS, STATEMENTS

Python Interpreter and Interactive mode; Values and Types: int, float, boolean, string, and list; Variables Expressions, Statements, Tuple assignment, Precedence of operators, Comments; Modules and Functions, Functio definition and use, Flow of Execution, Parameters and Arguments; Illustrative programs: Exchange the values o two variables, Distance between two points.

UNIT II: CONTROL FLOW, FUNCTIONS.

Conditionals: Boolean values and operators, Conditional (if), Alternative (if-else), Chained conditional (if-elif-else) Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope function composition, recursion; Strings: string slices, immutability, string functions and methods, string module Lists as arrays. Illustrative programs: square root, gcd, sum an array of numbers, Linear search, Binary search

UNIT III: LISTS, TUPLES, DICTIONARIES

Lists: List operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning lists, List parameters Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – lis comprehension; Illustrative programs: selection sort, insertion sort, mergesort.

UNIT IV: FILES, MODULES, PACKAGES AND EXCEPTION HANDLING

Files and exception: text files, reading and writing files, format operator; command line arguments, errors an exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

UNIT V:CLASSES AND OBJECTS

Implementation of classes and objects in Python: Classes and Objects, Methods and Self Argument, Th __init__Method, Class Variables and Object Variables, The __del__Method, Public and Private Data Member Private Methods,Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroyin Objects)

TEXT BOOKS:

1.Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

REFERENCE BOOKS:

Think Python , Allen Downey , Green Tea Press

E-RESOURCES:

https://www.tutorialspoint.com/python/index.htm

https://www.programiz.com/python-programming

https://www.w3schools.com/python/

https://www.javatpoint.com/python-tutorial

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Course Code-DATA BASE MANAGEMENT SYSTEMS

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:**

Credits: 3 **External Marks:**

Prerequisites:

Basic Database,Data Structures, Mathematics

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- Learn and practice data modelling using the entity-relationship and developing database designs
- To master the basics of SQL and construct queries using SQL.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurr data access
- Learn the concepts of transaction management and how they provide security and consistency
- Topics include data models, database design, relational model, relational algebra, transaction contr concurrency control, storage structures and access techniques.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Ability to define, understand the database management system structure

CO2 Ability to apply as relational algebra to find solutions to a broad range of queries.

CO3 Ability to create applications using various normal forms, functional dependencies, validating and identifyi anomalies

CO4 Will be able to explain the principle of transaction management design.

CO5 Understands and applies indexing mechanisms in databases

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2

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Agiripalli-521 212, Andhra Pradesh.

CO1	2	2	2	--	2	--	--	--	--	--	--	2	2	2
CO2	3	3	3	--	--	--	--	--	--	--	2	2	2	2
CO3	3	3	--	--	3	2	--	--	--	--	2	2	3	2
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2

UNIT I :

DATABASE SYSTEM APPLICATIONS:

Database System Applications, Purpose of Database Systems, File Systems versus a DBMS, View of Data – Data Abstraction, Instances and Schemas, Data Models, Data Independence, Database Users and Administrators, Structure of a DBMS.

INTRODUCTION TO DATABASE DESIGN:

Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT II:

INTRODUCTION TO THE RELATIONAL MODEL:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, Destroying/altering tables and views.

RELATIONAL ALGEBRA AND CALCULUS:

Relational Algebra – Selection and Projection, Set operations,Renaming, Joins,Division,Examples of Algebra Queries, Relational calculus – Tuple relationalCalculus – Domain relational calculus.

UNIT III:

SQL: QUERIES, CONSTRAINTS, TRIGGERS:

Form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL

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values, complex integrity constraints in SQL, Triggers and active data bases.

SCHEMA REFINEMENT:

Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functio dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valu dependencies, FOURTH normal form, FIFTH normal Form.

UNIT IV:

OVERVIEW OF TRANSACTION MANAGEMENT:

T: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurren Control, Deadlocks –Performance of Locking – Transaction Support in SQL.

CONCURRENCY CONTROL:

Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Loc Specialized Locking Techniques – Concurrency Control without Locking.

CRASH RECOVERY:

Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recoveryrelated Structures, the Wri Ahead Log Protocol, Check pointing, recovering from a SystemCrash, Media recovery.

UNIT V:

OVERVIEW OF STORAGE AND INDEXING:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Ind data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes a Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynan Index Structure.

TEXT BOOKS:

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NRI Institute of Technology
Agiripalli-521 212, Andhra Pradesh.

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition,2003.

2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.

3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant .Navathe,Pearson Education,2008.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*

3. Introduction to Database Systems, C. J. Date, *Pearson Education*

Oracle for Professionals, The X Team, S.Shah and V. Shah, *SPD.*

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, *PHI.*

6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student* Edition.

E-RESOURCES:

1.https://www.javatpoint.com/dbms-tutorial

2.https://www.tutorialspoint.com/dbms/index.htm

3.https://www.geeksforgeeks.org/dbms/

Course Code- Computer Organization and Architecture

Lecture – Tutorial-Practical:: 3-0-0

Internal Marks: 30

Credits: 3

External Marks: 70

Prerequisites:

NIL

Course Objectives:

- To study the basic philosophy underlying the various number systems, negative number representatio binary arithmetic, binary codes and error detecting and correcting binarycode.
- To study the combinational logic design of various logic and switching devices and theirrealization
- Understand the architecture of a modern computer with its various processing units. Also the Performar measurement of the computer system.
- The memory organization of the computer and input output organization understanding

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the numeric information in different forms and interpret different logic gates.
CO2	Analyze and Design various combinational circuits like Encoders, Decoders, Multiplexers, De-multiplexers, and Arithmetic Circuits.
CO3	Able to understand the basic components and the design of CPU, ALU and Control unit
CO4	Students can calculate the effective address of an operand by addressing modes
CO5	Ability to understand memory hierarchy and its impact on computer cost/performance..
CO6	Ability to understand the advantage of instruction level parallelism.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Higl

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSC
CO1	2	-	2	2	--	--	--	--	--	--	--	--	2	--	2
CO2	3	--	3	--	3	--	--	--	--	--	--	--	--	3	--
CO3	--	--	2	2	2	--	--	--	--	--	--	--	--	--	3
CO4	--	--	2	3	3	--	--	--	--	--	--	--	--	2	--

CO5	--	--	3	2	--	--	--	--	--	--	--	2	2	3	--
CO6	--	--	--	2	2	--	--	--	--	--	--	--	3	2	--

UNIT I :

NUMBER SYSTEMS & BOOLEAN FUNCTIONS: Representation of numbers in different radix, conversation fro one radix to another radix, r-1's compliments and r's compliments of signed numbers,Boolean theorems, principle complementation & duality, De-Morgans theorems, Basic logic gates and Universal gates, NAND-NAND and NO NOR realizations, Standard SOP and POS.

UNIT II:

Design of Half adder, full adder half subtractor, full subtractor, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, 4 bit parallel adder, Carry look-a- head adder circuit. Decoders, Encoders, priority encoder, Multiplexer, Demultiplexer. Basic Structure Of Computers : Computer Types, Functional unit, Basic Operational Concepts, Bus structures, Software, Performance.

UNIT III:

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Microoperations, Shift Micro-operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction codes, Computer Registers,Computer Instructions, Timing and Control, Instruction cycle, Memory ReferenceInstructions, Input-Output and Interrupts

UNIT IV:

Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).Computer Arithmetic : Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic Operations.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memo Virtual Memory, Memory Management Hardware.Input Output Organization: Peripheral Devices, Input-outp Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

TEXT BOOKS:

1 Morris M. Mano, Computer Systems Architecture.3 Ed, Pearson/PHI, 2013
2 Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

REFERENCE BOOKS:

John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.

E-RESOURCES:

https://www.tutorialspoint.com/computer_organization/index.asp

https://www.geeksforgeeks.org/computer-organization-basic-computer-instructions/

Course Code- INTERNET OF THINGS

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:** 3

Credits: 3 **External Marks:** 7

Prerequisites: Python programming

Course Objectives:

The objective of this course is to explore the interconnection and integration of the physical world and the cyl space. Understand the design concepts in setting up IOT Devices. Study about the setup, configuration and installati of equipment for IOT.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Understand Device-processor communication models & protocols.

CO2 Understand the application areas of IOT.

CO3 Visualize the effect of internet on Mobile Devices, Cloud & Sensor Networks.

CO4 Acquire programming experience with Raspberry Pi kit to interface various devices.

CO5 Implement Programming models for IoT Cloud Environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	2	2	--	--	2	--	--	--	2	--	--	--	2	--
CO2	--	--	--	2	--	--	2	--	--	--	--	--	2	
CO3	--	--	2	--	--	3	--	--	--	3	2	3	--	3
CO4	--	--	--	3	--	--	--	3	--	--	--	--	2	--
CO5	2	--	--	--	--	--	--	--	--	2	--	2	--	3

UNIT I : Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabl Technologies, IoT Levels and Deployment Templates

UNIT II: Domain Specific IoTs

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health Lifestyle

UNIT III: IoT AND M2M

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT IoT System Management: Need IoT Systems Management, SNMP, NETCONF, YANG, YANG-NETCONF, NETOPEER.

UNIT IV: IoT Physical Devices & Endpoints

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Interfaces (Serial, SPI, and I2C), Programming Raspberry Pi with Python, Other IoT Devices

UNIT V: **IoT Physical Servers and Cloud Offerings**

Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for Ic Python Web Application Framework – Django, Designing a RESTful Web API.

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, —Internet of Things - A Hands-on Approachǁ, Universities Press, 20 ISBN: 9788173719547.

2. Matt Richardson & Shawn Wallace, O'Reilly (SPD),ǁGetting Started with Raspberry Piǁ, 2014, ISB 978935023975.

REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Case (CRC Press).

2. Adrian McEwen, —Designing the Internet of Thingsǁ, Wiley Publishers, 2013, ISBN: 978-1- 118-43062-0.

3. Daniel Kellmereit, —The Silent Intelligence: The Internet of Thingsǁ, 2013, ISBN: 0989973700.

4. Ovidiu Vermesan, Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment", Ri

Publishers Series in Communication, June 2014.

E-RESOURCES:

https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf.

http://nptel.ac.in/courses/106105166

Course Code-Python Programming Lab

Lecture – Tutorial- Practical:: 0-0-3 **Internal Marks:** 1

Credits: 1.5 **External Marks:** 3

Prerequisites:

Adequate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

(ırse Objectives:

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

Students able to build software for real needs and prior introduction to testing software

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Experience with an interpreted Language and to build software for real needs

CO2 Use basic Decision structures, Boolean logic, variable types, assignments and operators.

CO3 Describe and use of Python lists, dictionaries, tuples and sets.

CO4 Implement methods and functions to improve readability of programs

CO5 Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.

CO6 Design, code ,test and debug python language programs

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS

	1	2	3	4	5	6	7	8	9	10	11	12	O1	O2
CO1	3	--	--	--	3	--	--	--	3	--	3	--	3	3
CO2	--	3	2	--	--	--	--	--	--	--	--	--	2	3
CO3	--	--	--	2	3	--	--	--	3	--	--	--	3	3
CO4	--	--	--	3	3	--	--	--	3	--	--	--	2	3
CO5	--	--	--	3	--	--	--	--	--	--	3	--	3	3
CO6	--	--	--	--	2	--	--	--	3	--	3	--	2	3

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user

(Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10

c) Write a program using a for loop that loops over a sequence.

d) Write a program using a while loop that asks the user for a number, and prints a countdownfrom that number to zero

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million

b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. Bystarting with 1 and 2, the first 10 terms will be:1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

c) By considering the terms in the Fibonacci sequence whose values do not exceed four million,find the sum of the even-valued terms

Exercise - 5 - DS

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character

ı quency to tell whether the given file is a Python program file, C program file or a text file?

xercise - 7 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

ıı (distance between two balls centers) <= (sum of their radii) then (they are colliding)

) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions- Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

E xrcise - 12 - Modules

Write a program that defines a module "person" and import it

b)write a program that renames a module

Exercise - 13 OOP

a) Class variables and instance variable and illustration of the self variable

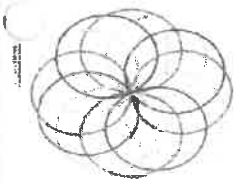
i) Robot

ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk

2. Write a program to implement the following figures using turtle:



Exercise - 15 - Testing

a) Write a test-case to check the function even_numbers which return True on passing a list of all even numbers

b) Write a test-case to check the function reverse_string which returns the reversed string

Exercise - 16 - Advanced

Build any one classical data structure

TEXT BOOKS:

1.Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

REFERENCE BOOKS:

Think Python , Allen Downey , Green Tea Press

E .ESOURCES:

.ps://www.tutorialspoint.com/python/
https://docs.python.org/3/tutorial/
https://www.w3schools.com/python/
https://www.javatpoint.com/python-tutorial

Course Code-DATABASEMANAGEMENTSYSTEMS LAB

Lecture – Tutorial- Practical:: 0-0-3 **Internal Marks:** 15

Credits: 1.5 **External Marks:** 35

Prerequisites:

C Programming, Mathematics

Course Objectives:

- Design and implement a database schema for a given problem-domain
- Populate and query a database using SQLDML/DDL commands.
- Declare and enforce integrity constraints on a database
- ProgrammingPL/SQLincludingstoredprocedures,stored functions,cursors,packages.
- Understand realtime database design models and cancodethemodel
- understandandretrieveinformationfromcomplexdesigneddatabasesusingcorrelatednestedqueries

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Queries for Creating, Dropping, and Altering Tables, Views, and Constraints

CO2 Queries to Retrieve and Change Data:Select, Insert,Delete,andUpdate

CO3 QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFunctionsandConversion Functions

CO4 Queries using GroupBy,OrderBy,andHavingClauses

CO5 Queries on Joins and CorrelatedSub-Queries

CO6 Queries on Controlling Data:Commit,Rollback,andSavepoint

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--

CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2	2
CO5	2	2	2	--	2	--	--	--	--	--	--	--	2	2
CO6	2	2	3	--	2	--	--	--	--	--	--	--	2	2

ListofExperiments :

SQL

1. QueriesforCreating,Dropping,andAlteringTables,Views,andConstraints
2. QueriestoRetrieveandChangeData:Select,Insert,Delete,andUpdate
   . QueriesusingoperatorsinSQL
4. QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFunctionsandConversion Functions
5. QueriesusingGroupBy,OrderBy,andHavingClauses
6. Queries on Controlling Data: Commit, Rollback, and Save point
7. Queries on Joins and Correlated Sub-Queries
8. Queries on Working with Index, Sequence, Synonym

PL/SQL

1. WriteaPL/SQLCodeusingBasicVariable,AnchoredDeclarations,andUsageofAssignmentOperation
2. WriteaPL/SQLCodeBindandSubstitutionVariables.PrintinginPL/SQL
3. WriteaPL/SQLblockusingSQLandControlStructuresinPL/SQL
4. WriteaPL/SQLCodeusingCursors,ExceptionsandCompositeDataTypes
5. WriteaPL/SQLCodeusingProcedures,Functions,TriggersandPackage

TEXT BOOKS:

FundamentalsofDatabaseSystems,ElmasriNavrate,6th edition, PearsonEducation

REFERENCE BOOKS:

1. "DatabaseSystemConcepts",.Korth,Slberchatz,Sudarshan,6thEdition,McGraw–Hill
2. PeterRobandCarlosCoronel,"DatabaseSystemsDesign,ImplementationandManagement",Thomson Learning,5thEdition.
3. IntroductiontoDatabaseSystems,CJDate,Pearson

DatabaseManagementSystems,RaghuramaKrishnan,JohannesGehrke,TATAMcGrawHill3rdEdition

Course Code- INTERNET OF THINGS LAB

Lecture – Tutorial- Practical:: 0-0-3 **Internal Marks:** 1

Credits: 1.5 **External Marks:** 3

Prerequisites: Python programming

Course Objectives:

The objective of this course, to give a comprehensive view of the —Internet of Things including Applicatio Potentials/ Challenges.To analyze enabling technologies to make it happen and to conduct Hands on activities .

Course Outcomes:

On successful completion of the course, the student will be able to:

CO1 Understand the application areas of IOT.

CO2 Understand building blocks of Internet of Things and characteristics.

CO3 Understand enabling technologies Embedded Devices and communication protocols for Hands on activities

CO4 Write programs using Python for processing Internet of Things

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
1	3	--	--	--	--	2	--	3	--	--	2	--	3	--
CO2	--	--	2	2	--	--	2	--	2	2	--	2	--	2
CO3	--	3	--	--	3	--	--	--	--	--	--	--	--	3
CO4	--	--	--	--	--	--	--	3	--	--	2	--	3	--

CYCLE 1:

CYCLE - 1: Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touc mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

CYCLE II:

1. Run some python programs on Pi like:
2. Read your name and print Hello message with name
3. Read two numbers and print their sum, difference, product and division.
4. Word and character count of a given string
5. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from stand input
6. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
7. Handle Divided by Zero Exception.
8. Print current time for 10 times with an interval of 10 seconds.
9. Read a file line by line and print the word count of each line.

CYCLE III:

1. Light an LED through Python program
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.

CYCLE IV:

1. Access an image through a Pi web cam.
2. Control a light source using web page.
3. Implement an intruder system that sends an alert to the given email.
4. Get the status of a bulb at a remote place (on the LAN) through web.

CYCLE V:

1. Get an alarm from a remote area (through LAN) if smoke is detected.
2. Display the room temperature on the display devices using sensors.
3. The student should have hands on experience in using various sensors like humidity, smoke, light, etc. a should be able to use control web camera, network, and relays connected to the Pi.

REFERENCE BOOKS:

1. wwwusers.di.uniroma1.it/~spenza/files/labIoT2015/Lab-IoT-1.pdf.
2. www.mobileeducationkit.net/labmanuals/LAB-Manual-mbed.docx

APTITUDE AND REASONING

COURSE DESCRIPTION AND OBJECTIVE:

1. Students will be introduced to various Arithmetic and Reasoning Problems.
2. The students will have acquaintance with various topics like Time, Speed and Distance, Percentages, Data Interpretation etc…
3. Aptitude is designed to assess the logical thinking and how well they are able to think out of the box. These ability tests (All the companies do prefer this test) are strictly timed to assess the speed and accuracy of the students in solving the problems.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to

1. Solve the Arithmetic and Reasoning Problems as fast as possible and as simple as possible.
2. Exhibits good analytical skills and aptitude skills.
3. Perform well in all competitive exams like RRB, SSC, GROUPS, and BANKING etc…
4. Clear the aptitude section of exams for higher education like CAT, GMAT, and GRE etc…

UNIT – I

1. PERCENTAGES
2. SIMPLE INTEREST & COMPOUND INTEREST

UNIT – II

1. TIME AND WORK
2. PIPES AND CISTERN

UNIT- III

1. DIVISION OF WAGES
2. MAN DAYS & CHAIN RULE

UNIT- IV

1. CODING AND DECODING
2. ALPHABET & NUMBER SERIES

UNIT – V

1. ANALOGY

2. ODD ONE OUT

TEXT BOOKS:

1) **APTIPEDIA, WILÉY**
2) **Quantative Aptitude, RS AGARWAL, S.Chand Publishers**

REFERENCE BOOKS:

1). HOW TO PREPARE FOR Quantative Aptitude, ARUN SHARMA, Mc GRAW HILL

Course Code- Web Application Development Using Full Stack – Frontend Development – Module - I

Lecture – Practical::	**Tutorial-** 0-0-4	**Internal Marks:**	15
Credits:	2	**External Marks:**	35

Prerequisites:

Course Objectives:

The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze a web page and identify its elements and attributes
CO2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascad Style sheet
	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
CO4	Create web pages using HTML and Cascading Style Sheets.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2	2

List of Experiments :

ML

1) Introduction to HTML
2) Browsers and HTML
3) Editor's Offline and Online
4) Tags, Attribute and Elements
5) Doctype Element
6) Comments
7) Headings, Paragraphs, and Formatting Text
8) Lists and Links
9) Images and Tables

B) CSS

1) Introduction CSS
2) Applying CSS to HTML
3) Selectors, Properties and Values
4) CSS Colors and Backgrounds
5) CSS Box Model
6) CSS Margins, Padding, and Borders
7) CSS Text and Font Properties
8) CSS General Topic

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2205403	Operating Systems	3	0	0	3	30	70	100	3
5	20A2205404	Formal Languages and Automata theory	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2205493	Operating Systems and Unix Programming Lab	0	0	3	3	15	35	50	1.5
9	SOC	Applications of Python-Numpy, Pandas	0	0	4	4	15	35	50	2
10	20A2200802	Professional ethics and Human Values	0	2	0	2	30	70*	100	0
Total			15	2	13	30	240	560	800	21.5

H.O.D

Head, CSE Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl.), Krishna Dist.

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2205403	Operating Systems	3	0	0	3	30	70	100	3
5		Humanities elective	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2205493	Operating Systems and Unix Programming Lab	0	0	3	3	15	35	50	1.5
9	SOC	Applications of Python-Numpy, Pandas	0	0	4	4	15	35	50	2
10	20A2200802	Professional ethics and Human Values	0	2	0	2	30	70*	100	0
Total			**15**	**2**	**13**	**30**	**240**	**560**	**800**	**21.5**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

Internship2Months(Mandatory)during summer vacation				
Honors/Minorcourses (The hours distribution can be3-0-2or3-1-0also)	**4**	0	**0**	**4**

Humanities elective

20A2200111	Professional Communication Skills
20A2200112	Visual Communication
20A2200114	Psychology
20A2200115	Engineering Philosophy

20A2200201-PROBABILITY AND STATISTICS

Lecture – Tutorial: 3-0-0 **Internal Marks:** 30
Credits: 3 **External Marks:** 70
Prerequisites:--- NIL

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT I

Descriptive Statistics and Methods for Data Science : Data Science- Introduction to Statistics- Population Vs sample – Collection of Data – Primary and Secondary Data - Types of Varibales : Dependent and Independent , Catagorical and Continuous Variables – Data Visualization - Measures of Central Tendency - Measures of Variability (spread and variance) – Skewness and Kurtosis

UNIT II

Correlation and Curve Fitting : Correlation –Correlation Coefficient – Rank Correlation – Regression Coefficients and properties – Regression lines – Method of Least Squares – Straight line – parabola – Exponential –power curves

UNIT III

Probability and distributions: Probability and conditional probability-Baye's theorem-Random variables- Discrete and continuous Random variables –Distribution Function- Mathematical Expectation and Variance – Binomial ,Poisson and Uniform and Normal Distributions

UNIT IV

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Representation of the normal theory distributions — Point and Interval estimation – Maximum error of estimate. Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance

UNIT V

One tail and two-tail tests-Tests Concerning One Mean and Two Means (Large Samples) – Tests on Proportions. Introduction to t, χ^2 and F – Tests.

TEXT BOOKS:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

E-RESOURCES:

1.nptel

Course Code- Web Technologies

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Java Programming

2.DataBaseManagementSystems

Course Objectives:

To understand the concepts of Hyper Text Markup Language and Cascading Style Sheets

To learn JavaScript for creating dynamic websites

To learn the operations perform on data among web applications usingXML

To learn Server-SideProgramming using Servlets and JavaServerPages.

To learn the creationof pure DynamicWebApplication using JDBC

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Student able to Implement and design webbased applications using features of HTML
CO2	Implement webbased applications using features of XML
CO3	Student will Apply the concepts of server side technologies for dynamic web applications
CO4	Ability to design the webbased applications using effective database access with rich client interaction
CO5	Abilityto Develop reusable component for Graphical User Interface applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	I S (3

Course Code- SOFTWARE ENGINEEEING

Lecture – Tutorial-Practical::	3	**0**	**0**	**Internal Marks:**	30
Credits:	3			**External Marks:**	70

Prerequisites:

Programming and problem solving, General Aptitude

Course Objectives:

1. To study pioneer of Software Development Life Cycle, Development models and Agile Software development.
2. To study the concepts related to analysis, design concepts of software development
3. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
4. To discuss various software testing strategies viz., unit test; integration, regression, and system testing and validation testing
5. To learn the process of improve the quality of software work products.
6. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concepts of Software engineering and applications
CO2	Compare different software engineering process models
CO3	Analyze the principles of requirement Engineering
CO4	Create design models for software Engineering projects
CO5	Apply different testing techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--	--
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3	--

CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--	--
CO4	--	2	--	--	--	--	--	--	--	3	--	--	2	--	3
CO5	--	--	2	--	--	--	--	--	--	2	--	--	--	3	--

UNIT I :

Software and Software Engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, The Essence of Practice, General Principles, Software Myths.

The Software Process: Software Engineering, Software Process, Generic process model, Prescriptive process model, specialized, unified process, Agile development, Agile Process, Extreme Programming, Other agile process models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process technology, Product and Process.

UNIT II:

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.

Principles that guide practice, Software Engineering Knowledge, Principles That Guide Process, Principles That Guide Practice, Principles That Guide Each Framework Activity, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III:

Requirements Modeling: Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling. **Requirements Modeling:** Flow, Behavior, Patterns, And Web apps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirement modeling for WebApps.

UNIT IV:

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.

Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs.

Modeling Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

UNIT V:

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.

Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.

TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.

2. Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.

REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009
2. RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

E-RESOURCES:

1. http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf
2. http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf
3. http://sites.computer.org/ccse/SE2004Volume.pdf
4. http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF
5. http://www.dau.mil/pubs/pdf/SEFGuide 01-01.pdf
6. https://nptel.ac.in/courses/106101061/2
7. https://nptel.ac.in/courses/106101061/5

OPERATINGSYSTEMS

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Basics of Computer Organization.

Course Objectives:-Upon completion of this course, the student will be able to acquire the basic operating system concepts such as processes & threads.Explain the Details of some units such as memory management, I/O, and File systems.

CourseOutcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the important computer system resources and the structure and functioning of operating system.
CO2	Understand process management policies and scheduling of processes by CPU.
CO3	Evaluate the requirement for process synchronization and coordination handled by operating system. Describe and analyze the memory management and its allocation policies.
CO4	Understand demand paging, thrashing and principles of deadlocks.
CO5	Understand File system Interface, File System implementation, Mass-storage structure and Disk scheduling algorithms.

ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1–Low,2-Medium,3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-

UNITI :

Computer System and Operating System Overview: Overview of computer operating systems ,operatin systems functions, operating systems structures and systems calls, operating systems generation.

UNITII:

Process Management – Process concept- process scheduling, operations, Inter process communicatior MultiThread programming models. Process scheduling criteria and algorithms and their evaluation.

UNITIII:

Concurrency:Processsynchronization, thecritical-sectionproblem, Peterson'sSolution, synchronizatio Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples.
MemoryManagement:Swapping, contiguous memory allocation, paging, structure of the page tabl segmentation.

UNITIV:

Virtual Memory Management: virtual memory, demand paging, page-Replacement, algorithms, Allocation Frames, Thrashing. **Principles of deadlock** – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

UNITV:

File System Interface-The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.
File System implementation-File system structure, file system implementation, directory implementation, allocation methods, free-space management
Mass-storagestructure:overview of Mass storage structure, Diskstructure, disk attachment, disk scheduling, swap-space management.

TEXTBOOKS:

1. OperatingSystemConcepts-AbrahamSilberchatz,PeterB.Galvin,GregGagne7thEdition,JohnWiley.
2. OperatingSystems–InternalandDesignPrinciples,WilliamStallings,SixthEdition–2005,PearsonEducation.

REFERENCEBOOKS:

1. Operatingsystems-AConceptbasedApproach-D.M.Dhamdhere,2ndEdition,TMH.
2. OperatingSystemADesignApproach-Crowley,TMH.
3. ModernOperatingSystems,AndrewSTanenbaum3rdeditionPHI.

E-RESOURCES:

https://nptel.ac.in/courses/106105214/
https://www.udacity.com/course/introduction-to-operating-system-ud923
https://www.youtube.com/watch?v=qf668RboXLs
https://www.youtube.com/watch?v=VoaNyf9iO4Q&list=PLV8vIYTIdSnaHTjrBXjSyNTOWEtA33hvn

COURSE CODE- WEB TECHNOLOGIES LAB

Lecture – Tutorial- Practical:: 0-0-3

Internal Marks: 15

Credits: 1.5

External Marks: 35

Prerequisites:

1. **JavaProgramming**

2.**DataBaseManagementSystems**

Course Objectives:

1	HyperTextMarkupLanguage(HTML)andCascadingStyleSheets(CSS)forlayingout(formatting)pages that contain text, images andgraphics
2	ExtensibleMarkupLanguages(XMLisusedtostoreandtransportdataamongwebpages),amechan ismfordefining newtagsets and interchangingdataamongwebapplications
3	Client-sideProgrammingusingJavaScriptforvalidatingthe data
4	Server-SideProgrammingusingservletsaretogeneratestaticcontentandJavaServerPagesareusedtogener ate dynamiccontent
5	CreatingapureDynamicWebApplicationwhichretrievesthedatafromDatabaseaccordingtothecl ient request usingJDBC
6	CreatingapureDynamicWebApplicationwhichretrievesthedatafromDatabaseaccordingtothecl ient request usingPHP

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Createawebsitestaticallyordynamically

CO2 Getknowledgeon displayingand decoratingthecontentsin awebpage.

CO3 Learntheconceptsofstoreandtransportthedataamongwebpages

CO4 Createobjectswithwhichtheclientcancommunicatewithserver.

CO5 Generatestaticordynamiccontentaccordingtotheclient'srequest

CO6 ProvideUser Authentication byusingcookiesand back end operations usingJDBC and PHP

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

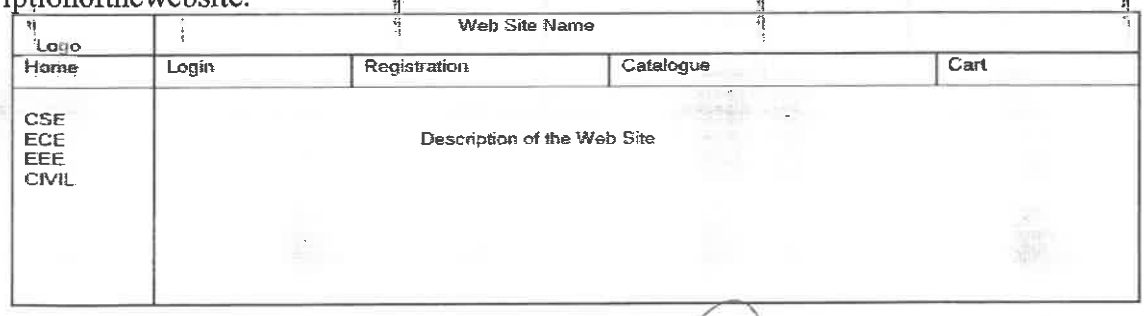
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	-	3	-	-	-	-	-	-	-	-	2	3	3
CO2	-	-	3	-	-	-	-	-	-	-	-	2	3	3
CO3	3	-	2	-	-	-	-	-	-	-	-	2	3	3
CO4	-	3	3	2	-	-	-	-	-	-	-	2	3	3
CO5	-	3	-	3	2	-	-	-	-	-	-	3	3	3
Total	3	6	11	5	2	-	-	-	-	-	-	11	3	3

Week-1:
Designthefollowingstaticweb pagesrequired foranonlinebook storeweb site.
Week-1:
Designthefollowingstaticweb pagesrequired foranonlinebook storeweb site.
1)**HOMEPAGE:**
Thestatichomepagemust containthree**frames**.

Topframe: Logoandthecollegenameandlinkstohomepage,Loginpage,Registrationpage, Catalogue pageandCartpage (thedescriptionof these pageswillbegivenbelow).

Leftframe: Atleastfourlinksfornavigation,whichwilldisplaythecatalogueofrespectivelinks. Fore.g.:Whenyouclickthelink**"CSE"**thecatalogueforCSEBooksshould be displayedintheRightframe.

Rightframe: The*pagestothelinksintheleftframemustbeloadedhere*.Initiallythispagecontains descriptionofthewebsite.



2) LOGINPAGE:
Thispagelooks likebelow:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: Submit Reset			

3) CATOLOGUEPAGE:

Thecataloguepageshouldcontain thedetails ofall thebooksavailable inthe websiteina table.Thedetails should contain the following:

1. SnapshotofCoverPage.
2. AuthorName.
3. Publisher.
4. Price.
5. Addto cartbutton.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
		Book : AI Author : S.Russel Publication : Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam publication	$ 50	Add to cart

Note:Week2 containstheremainingpages andtheir description.

Week-2:

4) CARTPAGE: Thecart pagecontainsthedetailsabout thebookswhich areaddedto thecart.Thecartpageshould look likethis:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	**Book name**	**Price**	**Quantity**	**Amount**
	Java 2	$35.5	2	$70
	XML bible	$40.5	1	$40.5
			Total amount -	$130.5

5) REGISTRATIONPAGE:

Createa"*registrationform* "withthefollowingfields

1) Name(Textfield)
2) Password(passwordfield)
3) E-mailid (textfield)
4) Phonenumber(text field)
5) Sex (radiobutton)
6) Dateofbirth(3selectboxes)
7) Languagesknown(checkboxes –English,Telugu,Hindi,Tamil)
8) Address(textarea)

WEEK3:

VALIDATION:

Write*JavaScript* to validatethe followingfields oftheaboveregistrationpage.

1. Name(Name shouldcontains alphabetsand thelength shouldnot belessthan 6characters).
2. Password(Passwordshouldnot belessthan6 characterslength).
3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
4. Phone number (Phone number should contain 10 digits only).Note:Youcan alsovalidatetheloginpagewiththeseparameters.UsePHPto connectwiththedatabaseto storetheabovedetails.

Week-4:

Designawebpageusing **CSS (CascadingStyleSheets)**whichincludesthe following:

1) Usedifferent font, styles:

Inthestyledefinitionyoudefinehow eachselectorshouldwork(font,coloretc.).Then,inthebodyofyour pages,yourefertotheseselectorstoactivatethe styles.

Forexample:

```
<HTML>
<HEAD>
<style type="text/css">
B.headline {color:red; font-size:22px; font-family:arial; text-decoration:underline}
</style>

</HEAD>
```

```
<BODY>
<b>This is normal bold</b><br>
Selector {cursor:value}

For example:

<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>

<b class="headline">This is headline style bold</b>
</BODY>

</HTML>
```

2) Setabackgroundimage forboththepageandsingleelementson thepage.Youcan definethe background imageforthepagelikethis:

```
BODY {background-image:url(myimage.gif);}
```

3) Control the repetition of the image with the background-repeat property.Asbackground-repeat: repeat
tilesthe imageuntil theentirepageisfilled, justlikeanordinarybackground imageinplainHTML.

4) Define styles for links asA:link
A:visitedA:activeA:hover
Example:
<styletype="text/css">
A:link {text-decoration: none}A:visited {text-decoration: none}A:active{text-decoration:none}
A:hover{text-decoration:underline;color:red;}
</style>

5) Workwithlayers:
Forexample:
LAYER1ONTOP:
<divstyle="position:relative;font-size:50px;z-index:2;">LAYER1

LAYER2
LAYER2ONTOP:
<divstyle="position:relative;font-size:50px;z-index:3;">LAYER1
LAYER2

6) Add a customized cursor:Selector{cursor:value}

Forexample:

```
<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>
```

Week-5:

WriteanXMLfile which willdisplaytheBookinformation whichincludesthefollowing:

1) Title ofthebook
2) AuthorName
3) ISBNnumber
4) Publishername
5) Edition
6) Price

WriteaDocumentTypeDefinition(DTD)tovalidate theaboveXMLfile.DisplaytheXMLfileasfollows.
Thecontentsshouldbedisplayedinatable.Theheaderofthetableshouldbeincolor GREY.And the Authornamescolumnshouldbedisplayedinonecolorandshouldbecapitalizedandinbold.Useyour own colo forremaining columns.
UseXMLschemas XSLand CSS forthe abovepurpose.
Note:Giveatleastfor4 books. Itshouldbevalidsyntactically.Hint:You can usesome xml editors like XML-spy

Week-6:

1) InstallTOMCATwebserverandAPACHE.
Whileinstallationassignportnumber4040toTOMCATand8080toAPACHE.Makesurethattheseports areavailablei.e

no other process is usingthis port.
2) Accesstheabovedevelopedstaticwebpagesforbookswebsite,usingtheseserversbyputtingthe web pages develope in week-1 andweek-2 in thedocument root.
Access the pages by using the urls :http://localhost:4040/rama/books.html (for tomcat)http://localhost:8080/books.html (forApache)

Week-7:
UserAuthentication:
Assumefourusersuser1,user2,user3anduser4havingthepasswordspwd1,pwd2,pwd3andpwd4respectively.
Writeaservelet fordoingthefollowing.

1. CreateaCookieandadd thesefouruser id'sand passwordsto this Cookie.
2. Readtheuseridandpasswordsenteredintheloginform(week1)andauthenticatewiththevalues(useridand passwords available in thecookies.

If heisavaliduser(i.e.,user-name andpassword match)youshould welcomehimbyname(user-name)elseyo ɔulddisplay"Youarenot anauthenticated user".
Useinit-parameterstodothis.Storetheuser-namesandpasswordsinthewebinf.xmlandaccessthemin theservle byusingthegetInitParameters() method.

Week-8:
Installadatabase(Mysql orOracle).
Createatablewhichshouldcontainatleastthefollowingfields:name,password,email-id,phonenumber(theseshould hol the data from theregistration form).
Practice'JDBC'connectivity.
Writeajavaprogram/servlet/JSP/PHPtoconnecttothatdatabaseandextractdatafromthetablesanddisplaythem.
Experiment with various SQLqueries.
Insertthedetailsoftheuserswhoregisterwiththewebsite,whenever anewuserclicksthesubmitbutton inthe registrati page(week2).

Week-9:
WriteaJSP whichdoes the followingjob:
Insert the details of the 3 or 4 users who register with the web site (week9) by using registrationform. Authenticat ..e user when he submits the login form using the user name and passwordfromthedatabase(similar to week instead of cookies).

Week-10:
Create tables in the database which contain the details of items (books in our case like Bookname , Price, Quanti Amount)) of each category. Modify your catalogue page (week 2)in sucha way that you should connect to t database and extract data from the tables and display theminthecataloguepageusingJDBC.

TEXT BOOKS:

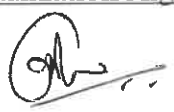
- TheComplete Reference,Java2, 3ed, PatrikNaughton, HerbertSchildt, TMH
- ProgrammingtheWorldWideWeb,RobetWSebesta,7ed,Pearson.
- WebTechnologies,UttamKRoy,OxfordJavaServerPages,HansBergstan,Oreilly

REFERENCE BOOKS:

- WebTechnologies,HTML<JavaScript,PHP,Java,JSP,XMLandAJAX,Blackbook,Dream Tech.
- AnIntroductiontoWebDesign,Programming,PaulSWang,SandaSKatila,Cengage
- AnintroductiontoWebDesignandProgramming,WangThomson
- Webapplicationtechnologiesconcepts,Knuckles,JohnWiley.
- Programmingworldwideweb,Sebesta,Pearson
- BeginningWebProgramming,JonDuckett,Wrox,WileyJavaserverpages,Pekowsky,Pearson

E-RESOURCES:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/perl/
3. https://www.railstutorial.org/book
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html



Course Code- SOFTWARE ENGINEEEING LAB

Lecture – Tutorial-Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites:

Programming and problem solving, General Aptitude

Course Objectives:

To understand the software engineering methodologies involved in the phases forproject development.

- To gain knowledge about open source tools used for implementing softwareengineering methods.
- To exercise developing product-startups implementing software engineering methods.
- To use Open source Tools, viz., StarUML / UMLGraph / Topcased

Course Outcomes:

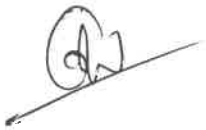
Upon successful completion of the course, the student will be able to:

CO1	Ability to translate end-user requirements into system and software requirements
CO2	Analyze the principles of requirement Engineering
CO3	Ability to generate a high-level design of the system from the software requirements
CO4	Create design models for software Engineering projects
CO5	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--	--
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3	--

CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--	--
CO4	--	2	--	--	--	--	--	--	--	3	--	--	3	--	3
CO5	--	--	3	--	--	--	--	--	--	2	--	--	--	3	--



List of Experiments

(For at least 4 problems)

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

1. Problem Analysis and Project Planning -Thorough study of the problem – IdentifyProject scope, Objectives and Infrastructure.
2. Software Requirement Analysis – Describe the individual Phases/modules of theproject and Identify deliverables. Identify functional and non-functional requirements.
3. Data Modeling – Use work products – data dictionary.
4. Software Designing - Develop use case diagrams and activity diagrams, build and testclass diagrams, sequence diagrams and add interface to class diagrams.
5. Prototype model – Develop the prototype of the product.

Sample Projects:

1. Course management system (CMS)

A course management system (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:

- An area for faculty posting of class materials such as course syllabus and handouts
- An area for student posting of papers and other assignments
- A grade book where faculty can record grades and each student can view his or hergrades
- An integrated email tool allowing participants to send announcement email messagesto the entire class or to a subset of the entire class
- A chat tool allowing synchronous communication among class participants
- A threaded discussion board allowing asynchronous communication among participants

In addition, a CMS is typically integrated with other databases in the university so that students enrolled in a particular course are automatically registered in the CMS as participants in that course.

The Course Management System (CMS) is a web application for department personnel, Academic Senate, and Registrar staff to view, enter, and manage course information formerly submitted via paper. Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

2. Easy Leave

This project is aimed at developing a web based Leave Management Tool, which is of importance to either an organization or a college.

The **Easy Leave** is an Intranet based application that can be accessed throughout the organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications,

cancellation of leave, automatic approval of leave, report generators etc in this Tool.

Functional components of the project:

There are registered people in the system. Some are approvers. An approver can also be a requestor. In an organization, the hierarchy could be Engineers/Managers/Business Managers/Managing Director etc. In a college, it could be Lecturer/Professor/Head of the Department/Dean/Principal etc.

Following is a list of functionalities of the system: A person should be able to

- login to the system through the first page of the application
- change the password after logging into the system
- see his/her eligibility details (like how many days of leave he/she is eligible for etc)
- query the leave balance
- see his/her leave history since the time he/she joined the company/college
- apply for leave, specifying the from and to dates, reason for taking leave, address for communication while on leave and his/her superior's email id
- see his/her current leave applications and the leave applications that are submitted tohim/her for approval or cancellation
- approve/reject the leave applications that are submitted to him/her
- withdraw his/her leave application (which has not been approved yet)
- Cancel his/her leave (which has been already approved). This will need to beapproved by his/her Superior
- get help about the leave system on how to use the different features of the system
- As soon as a leave application /cancellation request /withdrawal /approval /rejection /password-change is made by the person, an automatic email should be sent to the person and his superior giving details about the action
- The number of days of leave (as per the assumed leave policy) should be automatically credited to everybody and a notification regarding the same be sent to them automatically
- An automatic leave-approval facility for leave applications which are older than 2 weeks should be there. Notification about the automatic leave approval should be sent to the person as well as his superior

3. E-Bidding

Auctions are among the latest economic institutions in place. They have been used since antiquity to sell a wide variety of goods, and their basic form has remained unchanged. In this dissertation, we explore the efficiency of common auctions when values are interdependent- the value to a particular bidder may depend on information available only to others-and asymmetric. In this setting, it is well known that sealed-bid auctions do not achieve efficient allocations in general since they do not allow the information held by different bidders to be shared.

Typically, in an auction, say of the kind used to sell art, the auctioneer sets a relatively low initial price. This price is then increased until only one bidder is willing to buy the object, and the exact manner in which this is done varies. In my model a bidder who drops out at some price can "reenter" at a higher price.

With the invention of E-commerce technologies over the Internet the opportunity to bid from the comfort of one's own home has seen a change like never seen before. Within the span ofa few short years, what may have began as an experimental idea has grown to an immensely popular hobby, and in some cases, a means of livelihood, the Auction Patrol gathers tremendous response every day, all day. With the point and click of the mouse, one may bid on an item they may need or just want, and in moments they find that either they are the top bidder or someone else wants it more, and you're outbid! The excitement of an auction all from the comfort of home is a completely different experience.

Society cannot seem to escape the criminal element in the physical world, and so it is the same with Auction Patrols. This is one area where in a question can be raised as to how safe Auction Patrols.

Proposed system
To generate the quick reports
To make accuracy and efficient calculations
To provide proper information briefly
To provide data security
To provide huge maintenance of records Flexibility of
transactions can be completed in time

4. Electronic Cash counter

This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better out look to the user interfaces and to implement all the banking transactions like:

- Supply of Account Information
- New Account Creations
- Deposits
- Withdraws
- Cheque book issues
- Stop payments
- Transfer of accounts
- Report Generations.

Proposed System:

The development of the new system contains the following activities, which try to automatethe entire

process keeping in view of the database integration approach.

- User friendliness is provided in the application with various controls.
- The system makes the overall project management much easier and flexible.
- Readily upload the latest updates, allows user to download the alerts by clicking theURL.
- There is no risk of data mismanagement at any level while the project development isunder process.
- It provides high level of security with different level of authentication

Other Sample Projects :

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.

2. Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education

REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009
2. RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

E-RESOURCES:

1. http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf
2. http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf
3. http://sites.computer.org/ccse/SE2004Volume.pdf
4. http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF
5. http://www.dau.mil/pubs/pdf/SEFGuide 01-01.pdf
6. https://nptel.ac.in/courses/106101061/2
7. https://nptel.ac.in/courses/106101061/5

Operating Systems &Unix programming Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C-Programming

Operating Systems & Unix programming Lab

Course Objectives:

To understand the design aspects of operating system.
To study the process management concepts & Techniques.
To familiarize students with the Linux environment.
To learn the fundamentals of shell scripting/programming.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Students able to implement CPU scheduling algorithms ,File Organization techniques and paging techniques
CO2	Students able to write shell scripts in Linux platform.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	3	3	-	-	-	-	-	-
CO2	3	3	3	2	3	3	-	-	-	-	-	-

EXPERIMENTS :

PART-A

1. Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate MVT and MFT
3. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. …
7. Simulate Paging Technique of memory management.
8. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked

PART-B

1. Write a shell script to generate a multiplication table.
2. Write a shell script that copies multiple files to a directory.
3. Write a shell script which counts the number of lines and words present in a given file.
4. Write a shell script which displays the list of all files in the given directory.
5. Write a shell script(small calculator) that adds, subtracts, multiplies and divides the given two integers.
6. Write a shell script to reverse the rows and columns of a matrix.
7. Write a C program that counts the number of blanks in a text file.
8. C program Displaying real time of day for every 60 seconds
9. Write a C program that illustrates the creation of child process using fork system call.
10. Write a C program that illustrates file locking using semaphores.

11. Write a C program that implements a producer-consumer system with two processes.(using semaphores)
12. Write a C program that illustrates the following.
a)Creating a message queue.
b)Writing to a message queue.
c)Reading from a message queue.

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education
3.Advanced Programming in the UNIX Environment, 3rd EditionW. Richard Stevens, Stephen A. Rago
4.A Practical Guide to Linux Commands, Editors, and Shell ProgrammingMark G. Sobell, Matthew Helmke

REFERENCE BOOKS:

1. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.
4. The Linux Programming Interface.A Linux and UNIX System Programming Handbook Michael Kerrisk.
5. Shell Programming in Unix, Linux and OS XThe Fourth Edition of Unix Shell Programming
Stephen G. Kochan, Patrick Wood
6. Shell ScriptingHow to Automate Command Line Tasks Using Bash Scripting and Shell ProgrammingJaosn Cannon

E-RESOURCES:

https://www.tutorialspoint.com/unix/index.htm
https://www.guru99.com/unix-linux-tutorial.html
https://www.javatpoint.com/linux-tutorial
https://nptel.ac.in/courses/106105214/
https://www.udacity.com/course/introduction-to-operating-systems--ud923
https://www.youtube.com/watch?v=qf668RboXLs

Course Code- APPLICATIONS OF PYTHON- NumPy,Pandas

Lecture – Tutorial- Practical::	0-0-4	**Internal Marks:**	15
Credits:	2	**External Marks:**	35

Prerequisites:

Course Objectives:

The objective of this lab is to acquire programming skills in Python package NumPy and the fundamentals of the andas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the workings of various numerical techniques, different descriptive measures of Statistic correlation and regression to solve the engineering problems
CO2	Understand how to apply some linear algebra operations to n-dimensional arrays
CO3	Use NumPy perform common data wrangling and computational tasks in Python
CO4	Use Pandas to create and manipulate data structures like Series and DataFrames, work with arrays, querie and dataframes
CO5	Query DataFrame structures for cleaning and processing and manipulating files
CO6	Understand best practices for creating basic charts

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	--
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	2
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	--

1) Write a Pandas program to display the default index and set a column as an Index in a given dataframe.
2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a give dataframe.

D) Pandas String and Regular Expressions:
1) Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find th length of the string values.
2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.
3) Write a Pandas program to count of occurrence of a specified substring in a DataFrame column. 4) Write a Panda program to swap the cases of a specified character column in a given DataFrame.

E) Pandas Joining and merging DataFrame:
1) Write a Pandas program to join the two given dataframes along rows and assign all data.
2) Write a Pandas program to append a list of dictioneries or series to a existing DataFrame and display the combine data.
3) Write a Pandas program to join the two dataframes with matching records from both sides where available.

F) Pandas Time Series:
1) Write a Pandas program to create
a) Datetime object for Jan 15 2012.
b) Specific date and time of 9:20 pm.
c) Local date and time.
d) A date without time.
e) Current date.
f) Time from a datetime.
g) Current local time.
2) Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.
3) Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index

G) Pandas Styling:
1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.
2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.

H) Excel:
1) Write a Pandas program to import excel data into a Pandas dataframe.
2) Write a Pandas program to find the sum, mean, max, min value of a column of file.

I) Plotting:
1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock datase between two specific dates.
2) Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset

PROFESSIONAL ETHICS & HUMAN VALUES

Lecture – Tutorial:	2-0 Hours	Internal Marks:	30
Credits:	0	External Marks:	70

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

UNIT I

Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality. Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

UNIT II

Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment. Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different profesalonal roles.

UNIT III

Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons. Learning outcomes: 1. Demonstrate knowledge to become a social experimenter. 2. Provide depth knowledge on framing of the problem and determining the facts. 3. Provide depth knowledge on codes of ethics. 4. Develop utilitarian thinking

UNIT IV

Engineers Responsibility for Safety and Risk:

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis. 2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

UNIT V

Global Issues:

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research. Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research
4. Give a picture on weapons development.

TEXT BOOKS:

1). "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009

2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

3). "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill,-2003.

4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.

5) "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publications.

6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication.

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Mini project

Lecture – Tutorial-Practical: 0-1-3 Internal Marks: 30 Credits: 1 External Marks: 70*

The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research. The course Mini Project is one that involves practical work for understanding and solving problems in the field of computing. Any computer science project usually consists of the following: analysis, design, coding/implementation and testing of some information system or subsystem, such as, a piece of software. The subsystem does not have to be a computer program; a design document might be the appropriate output from a design study. The design and development of hardware system/subsystem would also be an appropriate project, however, in this course we expect a software system or subsystem. This course will also develop your investigative, research and report writing skills and will provide an opportunity for you, to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to complex computing problems.

Students can take up small problems in the field of Computer Science and Engineering as mini project. Project can be related to solution to an engineering problem, verification and analysis of experimental data available, conducting experiments on various engineering subjects, material characterization, studying a software tool for the solution of an engineering problem etc.

A batch of 3 students can form it as group The type of the project selection could be an application, product, a review or a research work. Project Review Committee will conduct 3 internal Reviews and one Final Review for 100 Marks.

Review I (Project Synopsis ,analysis) 20 Marks

Review II(Project Design) 20 Marks

Review III(Project Implementation) 20 Marks

Final Review (Project Evaluation with conclusion and report) 40 Mark

A.Y:- 21 - 22

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

IV CSE - I SEMESTER

L - LECTURE T – TUTORIAL P – PRACTICAL CIA – Continuous Internal Assessment SEA – Semester End Assessment

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	18A4100101	Managerial Economics and Financial Accounting	3	0	0	3	40	60	100	3
2	18A4105401	Cryptography and Network Security	3	0	0	3	40	60	100	3
3	PE-4	**Professional Elective - 4**	3	0	0	3	40	60	100	3
4	PE-5	**Professional Elective - 5**	3	0	0	3	40	60	100	3
5	OE-3	**Open Elective -3**	3	0	0	3	40	60	100	3
6	18A4105491	AI application Development Lab	0	1	2	3	40	60	100	1.5
7	18A4105492	Predictive Analytics Lab	0	1	3	4	40	60	100	2
8	18A4105493	Full Stack Web Development Lab	0	0	2	2	40	60	100	1
9	18A4105791	Minor project ##	0	1	3	4	40	60*	100	2
10	18A4100804	Research Methodology	2	0	0	2	40	60*	100	-
Total			**17**	**3**	**10**	**30**	**400**	**600**	**1000**	**21.5**

Code	Professional Elective -4	Code	Professional Elective -5
18A4105511	4.1 Natural Language Processing	18A4105521	5.1 Real Time Systems
18A4105512	4.2 AR & VR	18A4105522	5.2 Data Science
18A4105513	4.3 Block chain Technology	18A4105523	5.3 High performance computing
18A4105514	4.4 Intelligent Systems	18A4105524	5.4 Machine Learning

H.O.D

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

IV CSE - II Semester

L - LECTURE T – TUTORIAL P – PRACTICAL CIA – Continuous Internal Assessment SEA – Semester End Assessment

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	PE-6	**Professional Elective-6**	3	0	0	3	40	60	100	3
2	OE-4	**Open Elective-4**	3	0	0	3	40	60	100	3
3	18A4205791	Major Project (Internal/Industry Internship) dissertation***	0	5	7	12	40	60	100	8
Total			**6**	**5**	**7**	**18**	**120**	**180**	**300**	**14**

Code	Professional Elective - 6
18A4205511	6.1 Deep Learning
18A4205512	6.2 System Modeling and Simulation
18A4205513	6.3 Social Networking and Semantics
18A4205514	6.4 Cyber Forensics

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES

III YEAR – I SEMISTER

Code	Professional Elective – 1
18A3105511	1.1 Scripting Languages
18A3105512	1.2 Computer Graphics and Multimedia animation
18A3105513	1.3 Data Warehousing and Data Mining
18A3105514	1.4 Principles of Programming Languages

III YEAR – II SEMISTER

Code	Professional Elective -2
18A3205511	2.1 Advanced Database Management Systems
18A3205512	2.2 UML & Design Patterns
18A3205513	2.3 Distributed Systems
18A3205514	2.4 Adhoc and Sensor Networks

III YEAR – II SEMISTER

Code	Professional Elective -3
18A3205521	3.1 Computer Vision
18A3205522	3.2 Data Analytics
18A3205523	3.3 Software Testing Methodologies
18A3205524	3.4 Cloud Computing and Application Development

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES

IV YEAR – I SEMISTER

Code	Professional Elective -4
18A4105511	4.1 Natural Language Processing
18A4105512	4.2 AR & VR
18A4105513	4.3 Block chain Technology
18A4105514	4.4 Intelligent Systems

Code	Professional Elective -5
18A4105521	5.1 Real Time Systems
18A4105522	5.2 Data Science
18A4105523	5.3 High performance computing
18A4105524	5.4 Machine Learning

IV YEAR – II SEMISTER

Code	Professional Elective - 6
18A4205511	6.1 Deep Learning
18A4205512	6.2 System Modeling and Simulation
18A4205513	6.3 Social Networking and Semantics
18A4205514	6.4 Cyber Forensics

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
OPEN ELECTIVES

II YEAR – II SEMISTER

Code	Open Elective -1
18A2205601	1.1 Data Structures

III YEAR – I SEMISTER

Code	Open Elective -2
18A2205603	2.1 OOPS through C++
18A2205602	2.2 Java Programming

IV YEAR – I SEMISTER

Code	Open Elective -3
18A2205604	3.1 Database Management Systems

IV YEAR – II SEMISTER

Code	Open Elective -4
18A4105605	4.1 AI
18A4105606	4.2 Data Science

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Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1		Managerial Economics and Financial Accounting	3	0	0	3	40	60	100	3
2		Cryptography and Network Security	3	0	0	3	40	60	100	3
3	PE-4	**Professional Elective - 4**	3	0	0	3	40	60	100	3
4	PE-5	**Professional Elective - 5**	3	0	0	3	40	60	100	3
5	OE-3	**Open Elective -3**	3	0	0	3	40	60	100	3
6	LAB	AI application Development Lab	0	1	2	3	40	60	100	1.5
7	LAB	Predictive Analytics Lab	0	1	3	4	40	60	100	2
8	LAB	Full Stack Web Development Lab	0	0	2	2	40	60	100	1
9		Minor project ##	0	1	3	4	40	60*	100	2
10		Research Methodology	2	0	0	2	40	60*	100	-
Total			**17**	**3**	**10**	**30**	**400**	**600**	**1000**	**21.5**

Code	Professional Elective -4	Code	Professional Elective -5
	4.1 Natural Language Processing		5.1 Real Time Systems
	4.2 AR & VR		5.2 Data Science
	4.3 Block chain Technology		5.3 High performance computing
	4.4 Intelligent Systems		5.4 Machine Learning

* No External Evaluation

IV CSE - II Semester

L - LECTURE T – TUTORIAL P – PRACTICAL CIA – Continuous Internal Assessment SEA – Semester End Assessment

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	PE-6	**Professional Elective-6**	3	0	0	3	40	60	100	3
2	OE-4	**Open Elective-4**	3	0	0	3	40	60	100	3
3		Major Project (Internal/Industry Internship) dissertation***	0	5	7	12	40	60	100	8
Total			**6**	**5**	**7**	**18**	**120**	**180**	**300**	**14**

Code	Professional Elective - 6
	6.1 Deep Learning
	6.2 System Modeling and Simulation
	6.3 Social Networking and Semantics
	6.4 Cyber Forensics

* Professional Elective- 6 and OE-4 is offered through blended learning method. Regular classes as well as online classes will be conducted as per the choice of the students (moocs). However, students will have to write their regular exam at the end semester.

** Internship or Professional certification courses may be opted as self-learning course. Students register and complete the opted course in approved technology platform on or before Last Instruction Day of VIII Semester. They have to submit the certificate before the last Instruction Day of VIII Semester.

Technical Writing/Paper publication in a reputed journal can be done on or before Last Instruction Day of VIII Semester.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Lecture - Tutorial:	3 -0-0	**Internal Marks:**	40
Credits:	**3**	**External Marks:**	60

Course Objectives:

- To enhance the knowledge of the students regarding importance of management and Managerial problems wi optimum solutions and demand r»recosfing methods.
- To develop the concepts viz., consumer behavior and demand concept.
- To provide the knowledge regarding production and cost and break even analysis.
- To share the concepts like market structures and business organization.
- To provide awareness regarding capital budgeting decisions & give an idea nf practicing technique of ratio analysis.

To introduce the concepts- Financial Accounting.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Use the theory of managerial economics, demand, production analysis and forecasting theories.
CO2	Analyse of production markets and pricing strategies. Functions and cost-price functions to manage markets & break-even point.
CO3	Develop ability to identify, formulate and solve engineering problem by applying the knowledge of managerial economics.
CO4	Theorize about characteristics features and types of industrial organization, concept of changing business environment in post-liberalization scenario.
CO5	Enhance their capabilities in the interpretation of b/s that are followed in industries, organizational and industries.
6	Apply financial analysis, capital budgeting techniques in evaluating various investment opportunities.

Contribution of Course Outcomes towards achievement of Program Outcomes (I- Low, 2- Medium, 3 — High)

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P 1
CO1	1											
CO2		1										
CO3	2	2	1									
CO4			1				1					
CO5	1		1			2						
CO6	1				1						1	

UNIT I

Introduction to Managerial Economics and Demand Analysis
Nature and scope of managerial economics & its relationship with other subjects concept of demand, Determinant demand-law of demand &its limitations Elasticity of demand Types of measurements- De mand r»recasting and method

UNIT II

Cost Analysis & Introduction to Markets
Different cost concepts: Opportunity costs, Explicit & Implicit costs, Fixed & Variable costs Average & Marginal. Shoi run & Long run costs, Break Even Analysis(Simple Problems), market-nature and types-monopolistic competition oligopoly

UNIT III

Types of Business Organization & Business Cycles
Features and Evaluation of sole Trader, Partnership, Joint Stock company & Co-operative Societies. Business Cycles: Meaning & features of Business cycles-Phases & control of Business cycles-concept of money and mnney supply, Functi of Commercial banks and RBI credit control methods

UNIT IV

Introduction to Accounting and **Financial** Analysis
Introduction to Double entry system, Journal, Ledger, Trial balance & fiinal Accounts
Financial Analysis
Ratio Analysis- Need & significance(Simple Problems) Cap ital budgeting Meaning & importance- Methods of Capital budgeting: payback period, ARR(Accounting Rate of Return), NPV(Net PresentValue)(Simple Problems)

TEXTBOOKS

- Dr. A.R. Aryasri-Managerial Economics and Financial Analysis TMH 201 1.
- Dr. N. Appo Rao, Dr. P. Vijay Kumar: Managerial Economics and Financial Analysis carigage publications, New Delhi-2011.
- Prof J.V. Prabhakara Rao, Pro(. P, Venkat Rao, Managerial Economics and Financial Analysis

REFERENCES

- V. Maheswari Managerial Economics Sultan fhand. 2014.
- Dr. B. Kuberudu and Dr. T. V. Ramana:managerial economits and Financial Analysis, Himalaya publishing House, 2014.
- Suma Damndaran: Managerial Economics, Oxford, 2011.
- Maheswari: Financial Accounting, Vikas Publications.
- Shailaja, Gajj;:la and Usha Munipnlle, Universities press, 2015
- Ranking Law and Practise, Gordan and Mithani, Himalaya Publications

E-RESOURCES

- http://nptel.ac.in/courses.php
- http://jntuk-coeerd.in/
- https://ocw.fnit.edu/courses/electrical-engineering- /

Course Code- Cryptography and Network Security

Lecture – Tutorial-Practical::		3	0	0	**Internal Marks:**	40
Credits:	3				**External Marks:**	60

Prerequisites:

Computer Networks, Arithmetic Calculations

Course Objectives:

- To present an overview of the main concepts of cryptography, understand the threats & attack understand ethical hacking
- To understand the difference between stream ciphers & block ciphers, present an overview of the Feist Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfis IDEA
- To present the basic principles of public key cryptography, Distinct uses of public key cryptosystems
- To Present overview of the basic structure of cryptographic functions, Message Authentication Code Understand the operation of SHA-512, HMAC, Digital Signature
- To Provide an overview of Key distribution and management, Email security, IP Security, web securit concept of firewalls, virus and Malicious code

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks.
CO2	Distinguish the black ciphers and stream ciphers and apply them on a various symmetric cryptographi techniques.
CO3	Understand the principle and mathematical models used in public-key cryptosystems by applying ther on different (various) types of algorithms.
CO4	Analyze the message authentication functions with its types and digital certifications for secure communication.
CO5	Understand the user authentications principles and security approach at both the web and email.
CO6	Understand the concept of Email, IP, web Security with its services and dealing with the firewalls an Viruses

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	2	-	-	-	-	-	-	3	-
CO2	3	3		2	-	2	-	-	-	-	-	-	3	-
CO3	3	3	-	2	-	-	-	-	-	-	-	-	3	2
CO4	3	3	-	2	-	-	-	-	-	-	-	-	3	2
CO5	3	2	-	2	-	-	-	-	-	-	-	-	3	2
CO6	3	2	-	2	-	-	-	-	-	-	-	-	3	2

UNIT I :

Introduction, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, Model for Network Security, **Classical Encryption Techniques**, Symmetric Cipher Model, Substitutic Techniques, Transposition Techniques, **Symmetric Encryption**, Mathematics of Symmetric Key Cryptograph **Modern Symmetric Key Ciphers**, Data Encryption Standard, Advanced Encryption Standard, BlowFis IDEA, CAST-128 algorithms

UNIT II:

Block Cipher Operations, Multiple Encryption and Triple DES, Electronic Codebook Mode, Cipher Bloc Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode, **Asymmetric Encryptio** Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat's and Euler Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Ke Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchang ElGamal Cryptosystem, Elliptic Curve Cryptography

UNIT III:

CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS, Cryptographic Hash Functions, Applications Cryptographic Hash Functions, Two Simple Hash Functions, Hash Functions Based on Cipher Block Chainin Secure Hash Algorithm (SHA), **Message Authentication Codes,** Message Authentication Functions, Messag Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MACs Based on Bloc Ciphers: DAA and CMAC

UNIT IV:

Digital Signatures, ElGamal Digital Signature Scheme, Schnorr, Digital Signature Scheme, Digital Signatu Standard (DSS), **Key Management and distribution**, **Electronic mail security**, PGP, S/MIME, IP Securit Web security, System Security, Intruders, Malicious Software, Viruses, Firewalls

TEXT BOOKS:

1. Cryptography And Network Security Principles And Practice 6th Edition, William Stallings, Pearson Education

2. Cryptography And Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, 3E) Mc Gra Hill

3. Atul Kahate, Cryptography and Network Security, TMH. (2003)

REFERENCE BOOKS:

1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition,2011, Pearson Education. 95
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

E-RESOURCES:

1. http://users.abo.fi/ipetre/crypto/
2. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
3. https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/
4. https://lecturenotes.in/subject/112/cryptography-and-network-security-cns
5. https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/
6. https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/
7. https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/

Course Code- Scripting Languages

Type of Course : Professional Elective – 1.1

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Computer Programming, Web Technologies

Course Objectives:

The goal of the course is to study:

- The principles of scripting languages.
- Motivation for and applications of scripting.
- Difference between scripting languages and non- scripting languages.
- Types of scripting languages.
- Scripting languages such as PERL,PHP.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Ability to master the theory behind scripting and its relationship to classic programming.
CO2	Ability to apply your knowledge of the weaknesses of scripting languages to select implementation.
CO3	Able to gain some fluency programming in Perl and related languages.
CO4	Identify PHP encryption functions and Mcrypt Package.
CO5	Understand PHP Authentication and Methodologies
CO6	To design and implement one's own scripting language.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	2
CO4	-	-	3	-	3	-	-	-	-	-	-	2
CO5	3	-	3	-	2	-	-	-	-	-	-	2
CO6	-	-	-	3	3	-	-	-	-	-	-	3

UNIT I :

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT II:

Advanced perl Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT III:

PHP Basics PHP Basics- Features, Embedding PHP Code in your Web pages, Outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures, Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

UNIT IV:

Advanced PHP Programming PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, Login Administration, Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package, Building Web sites for the World.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, WileyPublications.
2. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications(Dream tech)

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perland PHP, J.Lee and B.Ware (Addison Wesley) PearsonEducation.
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage LearningPublications.
3. PHP 5.1, I.Bayross and S.Shah, The X Team,SPD.
4. Perl by Example, E.Quigley, PearsonEducation.

E-RESOURCES:

1. https://www.perl.org/books/beginning-perl/
2. https://nptel.ac.in/
3. https://www.tutorialspoint.com/php/
4. https://www.tutorialspoint.com/perl/

COMPUTER GRAPHICS AND MULTIMEDIA ANIMATION

Type of Course :Professional Elective – 1.2

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

C- Programming, Mathematical fundamentals.

Course Objectives:

The objective of this course is to provide the knowledge about two-dimensional and three-dimensional graphics notations and their transformations. It also provides different Visible Surface detection methods and to gain knowledge about Multimedia Applications as well.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Design and apply two-dimensional primitives and filling methods
CO2	Design and apply two-dimensional and three-dimensional transformations.
CO3	Apply visible surface detection methods for identifying back-faces.
CO4	Understood Different types of Multimedia fundamentals.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	-	2	3	2	-	-	-	-	-	-
CO2	2	2	-	2	3	-	-	-	-	-	-	-
CO3	-	2	-	2	-	-	-	-	-	-	-	-
CO4	2	2	-	2	-	-	-	-	-	-	-	-

UNIT I :2D Primitives

2D Primitives: Application areas of Computer Graphics, Points and Lines, Line, Circle and Ellipse drawing algorithms, Filled area Primitives- Scan line polygon fill algorithm, Boundary fill algorithm, flood fill algorithm.

UNIT II: 2D Modeling

Two dimensional Geometric transformations: Translation, Rotation, Scaling, Reflection, Shear, Matrix representations in Homogeneous coordinates, Composite transformations, Transformations between coordinate systems, Affine Transformations.

Two dimensional viewing: The Viewing Pipeline, Viewing coordinate Reference Frame, Window-to-View-Port Transformation, Line, Polygon, Curve and Text are clipping algorithms

UNIT III: 3D Modeling

3D Transformations: Translation, Rotation, Scaling, Reflection and Shear Transformations, Composite Transformations.

3D Viewing: Viewing Pipeline, Viewing coordinate Reference frame, Clipping, Parallel and Perspective projections.

Visible surface identification Methods: Back-Face Detection, Z-Buffer, Depth-Sorting, Area Sub Division and Octree Methods.

UNIT IV: Multimedia Applications

Multimedia Basics- Multimedia Applications, Multimedia system architecture, Evolving technologies

for Multimedia, Defining objects for Multimedia systems, Multimedia data interface standards, Multimedia databases.

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M,-"Computer Graphics" Prentice Hall, New Delhi, 2007 [Unit I-III]
2. Andleigh, P.K and Kiran Thakrar,-Multimedia Systems and DesignI,PHI, 2003[Unit-IV]

REFERENCE BOOKS:

1. Hill F S Jr., "Computer Graphics", Maxwell Macmillan 1990.

E-RESOURCES:

1. https://www.blender.org/support/tutiorals.
2. https://www.slideshare.net/deepakmohapatra102/computer-graphics-30123690
3. https://www.academia.edu/6709255/LECTURE_NOTES_on_Computer_Graphics_and_Multimedia_Table_of_Contentshttps://www.academia.edu/5750589/Computer_Graphics_C_Version_by_Donald_Hearn_and_M_Pauline_Bake

Course Code-Data Warehousing and Data Mining
Type of Course :Professional Elective – 1.3

Lecture – Practical::	**Tutorial-** 3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

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Course Objectives: The objective of this course is to provide knowledge of techniques and strategies to create and use the data warehouses, to understand, learn different data mining techniques and to understand the applicability of these techniques.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concepts of warehousing and data preprocessing techniques
CO2	Derive various interesting patterns and associations in datasets.
CO3	Design and develop classifier models to predict future trends.
CO4	Apply unsupervised learning techniques for a given application.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	3	-	-	-	-	-	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-
CO3	2	2	-	3	2	-	-	-	-	-	-	2
CO4	3	2	-	3	-	-	-	-	-	-	-	2

UNIT I :

UNIT I: Data Warehouse and Online Analytical Processing: Data Warehouse basic concepts, Data Warehouse Modeling: Data cube and OLAP, Data Warehouse Implementation, Data Generalization by Attribute Oriented Induction. Data Preprocessing: Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

UNIT II:

Data Mining Introduction: Introduction, Why Data Mining, kinds of Data that can be mined, Patterns that can be Mined, technologies where it can be used, major issues in data Mining.

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Item-set Mining Methods. (Apriori and FP growth algorithms)

UNIT III:

Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Backpropagation, Support Vector Machines

UNIT IV:

Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN& OPTICS, introduction to outlier analysis

TEXT BOOKS:

[1].Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

REFERENCE BOOKS:

[1].G. K. Gupta ,"Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006

[2].A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to DataMining", Second Edition Pearson Education, 2016

[3].K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006

E-RESOURCES:

[1]Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017)https://www.youtube.com/watch?v=J326LIUrZM8&t=4s

[2]How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network (2016)https://www.youtube.com/watch?v=fwnaijgpih,

Principles of Programming Languages

Type of Course : Professional Elective – 1.4

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites:

C- Programming, Java basics and Operating System basics

Course Objectives:

1. To understand and describe syntax and semantics of programming languages
2. To understand data, data types, and basic statements
3. To understand call-return architecture and ways of implementing them
4. To understand object-orientation, concurrency, and event handling in programming languages
5. To develop programs in non-procedural programming paradigms

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze the basic concepts of programming language, the general problems and methods related to syntax & semantics.
CO2	Interpret the structured data objects, subprograms and programmer defined data types.
CO3	Outline the sequence control and data control.
CO4	Apply the concepts of storage management using programming languages.
CO5	Implementing the Subprogram call and return.
CO6	Classify various programming languages like procedural, non-procedural, structured and object oriented programming language.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	-	2	-	-	-	-	2	-	-	2	2
CO2	3	2	-	-	-	-	-		-	-	-	-
CO3	3	2	2	2		-	-	-	-	-	-	-
CO4	3	2	-		2	-	-	-	-	-	-	-
CO5	3	-	2	-	-	-	-	-	-	-	-	-
CO6	3	2	2	-	-	-	-	-	-	2	2	2

Syllabus :

UNIT I :

SYNTAX AND SEMANTICS: Evolution of programming languages, describing syntax: context,free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT II:

DATA, DATA TYPES, AND BASIC STATEMENTS: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT III:

SUBPROGRAMS AND IMPLEMENTATIONS: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT IV:

OBJECT- ORIENTATION, CONCURRENCY, AND EVENT HANDLING: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores,
Monitors, message passing, threads, statement level concurrency, exception handling, event handling

FUNCTIONAL PROGRAMMING LANGUAGES: Introduction to lambda calculus, fundamentals of functional
programming languages, Programming with Scheme, – Programming with ML,

LOGIC PROGRAMMING LANGUAGES: Introduction to logic and logic programming, – Programming with Prolog, multi - paradigm languages

TEXT BOOKS:

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Programming Languages, Principles & Paradigms, 2ed, Allen B Tucker, Robert E Noonan, TMH

REFERENCE BOOKS:

1.R.Kent Dybvig, "The Scheme Programming Language",Fourth Edition,MIT Press,2009,
2.Jeffrey D.Ullman, "Elements of ML programming",Secondedition,Prentice Hall,1998
3.Richard A.O'Keefe, "The craft of Prolog",MIT Press,2009
4.W.F.Clocksin and C.S.Mellish,"Programming in Prolog:Using the IOS Standard", Fifth Edition,Springer,2004.

E-RESOURCES:

Scheme : https://www.scheme.com/tspl4/
Prolog : http://learnprolognow.org/
Haskell :http://learnyouahaskell.com/

Name of the Course: Advanced Data Base Management Systems
Type of Course: Professional Elective – 2.1

Lecture – Tutorial-Practical: 3-0-0 **Internal Marks:** 40
Credits:3 **External Marks:** 60

Prerequisites: DBMS,Programming concepts

Course Objectives:

1.Design databases using data models, Query and manage databases .
2.Distinguish between centralized and distributed databases
3.Implement applications involving complex transaction processing.
4.Do query evaluation and query optimization

COURSE OUTCOMES:Upon successful completion of the course, the student will be able to:

CO1	**Describe** basic database concepts, Data Models, Schemas, Instances, and Components in the DBMS architecture.
CO2	**Implement** practical solutions to GIS database problems using OO/OR database, spatial database, data warehousing and data mining approaches
CO3	**Evaluate** simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer
CO4	**Demonstrate** the issues involved in data integration for distributed query processing
CO5	**Develop** practical skills in the use of these models and approaches to be able to select and apply the appropriate methods for a particular case
CO6	**Analysed**internal structures, query evaluation and optimization.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	2	-	-	-	-	-	2	-	-	-
CO2	3	-	2	-	2	-	-	-	2	-	-	-
CO3	2	2			2	-	-	-	-	-	3	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2
CO5	2	-	-	-	-	-	-	-	-	-	-	2
CO6	2	-	-	-	-	-	-	-	-	-	-	2

UNIT – I

INTRODUCTION

Introduction of object database systems: Structured data types, operations on structured data, encapsulation and ADTS, Inheritance.

ORDBMS

Database design for ORDBMS, ORBMS implementation and challenges, OODBMS, comparison of RDBMS, OODBMS and ORDBMS. Introduction to Parallel databases, architectures for parallel databases, Parallel Query Evaluation: Data partitioning and parallelizing sequential operator evaluation code, parallelizing individual operations, and parallel query optimization.

UNIT – II

DISTRIBUTED DATABASES

Introduction to distributed databases: Features of distributed databases vs centralized databases, Why distributed databases.

DDBMS: Levels of transparency, reference architecture for DDB, types of data fragmentation, distribution transparency for read-only and update applications, distributed database access primitives, Integrity constraints in distributed databases.

UNIT – III

DISTRIBUTED DATABASE DESIGN

Distributed database design: framework for distributed database design, the design of database fragmentation, allocation of fragments; Distributed Query processing: Equivalence of transformations for queries, transforming global queries into fragment queries, distributed grouping and aggregation functions.

UNIT – IV

QUERY OPTIMIZATION

A framework for query optimization, join queries and general queries. non-join queries in a distributed DBMS, joins in a distributed DBMS, cost based query optimization. DBMS Vs IR systems, Introduction to Information retrieval, Indexing for text search, web search engine, managing text in a DBMS, a data model for XML, Querying XML data, and efficient evaluation of XML queries.

TEXT BOOKS:

1. Raghuramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, TMH, 2006.
2. S Ceri and G Pelagatti, "Distributed databases principles and systems", 1st Edition, TMH, 2008.

REFERENCE BOOKS:

1. Silberschatz, Korth, "Database System Concepts", 6th Edition, TMH, 2010.
2. Elmasri R, Navathe S B, Somayajulu D V L N, and Gupta S K, "Fundamentals of Database Systems", 5th Edition, Pearson Education,2009.
3. C. J. Date, "Introduction to Database Systems", 8th Edition, Pearson Education, 2009.

E-RESOURCES:

Course Code- UML & Design Patterns
Type of Course :Professional Elective – 2.2

Lecture – Tutorial- Practical:: 3-0-0 | **Internal Marks:** 40

Credits: 3 | **External Marks:** 60

Prerequisites:

Basics of OOPS concepts

Course Objectives:

1. Introducing the Unified Process and showing how UML can be used within the process.
2. Presenting a comparison of the major UML tools for industrial-strength development.
3. introduction to design patterns, practical experience with a selection of central patterns.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Represent the data dependencies of a simple program using UML
CO2	Represent user and programmatic interactions using UML
CO3	Identify the purpose and methods of use of common object-oriented design patterns
CO4	Select and apply these patterns in their own designs for simple programs

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	3	-	-	-	-	-	2	2
CO2	2	2	2	2	3	-	-	-	-	-	2	2
CO3	2	2	2	2	3	-	-	-	-	-	2	2
CO4	2	2	2	2	3	-	-	-	-	-	2	2

UNIT I :

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced classes, advanced relationships, Object diagrams : common modeling techniques.

UNIT II:

Behavioral Modeling: Interactions, Interaction diagrams. Use cases, Use case Diagrams, Activity Diagrams.,Events and signals, state machines, state chart diagrams.

Advanced Behavioral Modeling: Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams, Common modeling techniques for component and deployment diagrams

UNIT III:

Introduction : What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

Creational Patterns : Abstract Factory, Builder, Factory Method, Prototype, Singleton,

UNIT IV:

Structural Patterns: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy.

Behavioral Patterns : Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, Strategy, Template Method, What to Expect from Design Patterns

TEXT BOOKS:

1. The unified Modeling language user guide by Grady Booch, James Rumbaugh , Ivar Jacobson, PEA
2. Design Patterns By Erich Gamma, Pearson Education

REFERENCE BOOKS:

1. Satzinger: Object Oriented Analysis and Design, CENGAGE
2. O'reilly ' s 'Head-First Design Patterns' by Eric Freeman et al, Oreillly
3. 'Applying UML and patterns' by Craig Larman, Pearson

E-RESOURCES:

https://nptel.ac.in/courses/106105153/

Type of Course :Professional Elective – 2.3
Course Code–Distributed Systems

Lecture – Tutorial – Practical:	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:
Operating Systems

Course Objectives:

- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed Computing infrastructures with various computing principles.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Describe important characteristics of distributed systems and the salient architectural features of such systems

CO2 Gaining practical experience of inter-process communication and remote invocation in a distributed environment

CO3 Describe the features and techniques used in distributed systems for implementing parallel processing and distributed file systems.

CO4 Describe techniques for implementing mutual exclusion, transaction processing and recovery concepts in distributed environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	2	2
CO2	2	2	2	2	-	-	-	-	-	-	2	2
CO3	2	2	2	2	-	-	-	-	-	-	2	2
CO4	2	2	2	2	-	-	-	-	-	-	2	3

UNIT I :

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. **System Models:** Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Security Model.

UNIT II:

Interprocess Communication: Introduction, The API for the Internet Protocols- The Characteristics of Interprocess communication, Sockets, UDP Datagram Communication, TCP Stream Communication; Client Server Communication;

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Remote Procedure Call, Events and Notifications.

UNIT III:

Operating System Support: Introduction, The Operating System Layer, Protection, Processesand Threads –Address Space, Creation of a New Process, Threads.

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems:

Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays.

UNIT IV:

Coordination and Alignment: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery.

TEXT BOOKS:

[1] George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", Fourth Edition, Pearson Publication

REFERENCE BOOKS:

[1] Ajay D Kshemkalyani, MukeshSighal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge

[2] Distributed-Systems-Principles-Paradigms-Tanenbaum PHI

E-RESOURCES:

https://nptel.ac.in/courses/106/106/106106168/

https://www.hpcs.cs.tsukuba.ac.jp/~tatebe/lecture/h23/dsys/dsd-tutorial.html

https://courses.cs.ut.ee/MTAT.08.009/2014_fall/uploads/Main/slides15-1.pdf

Course Code- Adhoc and Sensor Networks
Type of Course :Professional Elective – 2.4

Lecture – Tutorial- Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60
Prerequisites:			

Networks

Course Objectives: At the end of the course, the students will be able to:

- Understand the concept of mobile ad hoc networks, design and implementation issues and available solutions
- Demonstrate the routing mechanisms and three classes of approaches: proactive, on-demand, and hybrid
- Explain sensor networks and their characteristics. This includes design of MAC layer protocols, understanding of power management, query processing, and sensor databases.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand basic concepts of WIRELESS networks and challenges of adhoc and sensor networks
CO2	Classify the design issues and different categories of MAC protocols
CO3	Explain the various adhoc routing protocols and transport layer mechanisms
CO4	Discuss the sensor characteristics and wsn layer protocols and security issues

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

UNIT I :

Introduction to Ad Hoc Wireless Networks: Characteristics of MANETs, Applications of MANETs, Challenges.

Routing in MANETs: Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols.

UNIT II:

Data Transmission In MANETs: The Broadcast Storm, Multicasting, Geocasting

TCP over Ad Hoc Networks: TCP Protocol overview, TOP and MANETs, Solutions for TOP over Ad Hoc

UNIT III:

Basics of Wireless Sensors and Applications: The Mica Mote, Sensing and Communication Range, Design issues, Energy consumption, Clustering of Sensors, Applications

Data Retrieval In Sensor Networks: Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT IV:

Security:Distributed Systems Security,Security in Ad Hoc Networks ,Key Management,SecureRouting,Cooperation in MANETs,Wireless Sensor Networks,Intrusion Detection Systems.

TEXT BOOKS:

- Ad Hoc and Sensor Networks — Theory and Applications, Car/osCorderlo Dharma R Aggarwal, World Scientific Publications /Cambridge University Press, March 2006
- Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp 2009.

REFERENCE BOOKS:

- Adhoc Wireless Networks — Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education, 2004
- Wireless Sensor Networks — Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010
- Wireless Ad hoc Mobile Wireless Networks — Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008

Course Code- Computer Vision
Type of Course :Professional Elective – 3.1

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: Image processing

Course Objectives:

Computer Vision focuses on development of algorithms and techniques to analyze and interpret the visible world around us. This requires understanding of the fundamental concepts related to multi-dimensional signal processing, feature extraction, pattern analysis visual geometric modeling, stochastic optimization etc. Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision. Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describes the fundamental of image formation and depth estimation of the techniques.
CO2	Describes the feature extraction of the filters.
CO3	Describe the classification of the segmentation techniques and analyze the clusters methods
CO4	Analyze the clusters methods of image patterns
CO5	Illustrate motion analysis of spatio temp techniques.
CO6	Illustrate shape from texture color motion and edges.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	-	-	-
CO6	3	3	3	-	-	-	-	-	3	-	-	3

UNIT I :

Digital Image Formation and low-level processing

Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Depth Estimation and Multi Camera Views:

Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration

UNIT II:

Feature Extraction:

Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT III:

Image Segmentation:

Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection.

Pattern Analysis:

Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA; Non-parametric methods.

UNIT IV:

Motion Analysis:

Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Shape from X:

Light at Surfaces; Phong Model; Reflectance Map; Albedo estimation; Photometric Stereo; Use of Surface Smoothness Constraint; Shape from Texture, color, motion and edges.

TEXT BOOKS:

1 Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2 Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.

REFERENCE BOOKS:

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. K. Fukunaga; Introduction to Statistical Pattern Recognition, Second Edition, Academic Press, Morgan Kaufmann, 1990.

E-RESOURCES:

1. https://nptel.ac.in/courses/106105216/
2. https://cw.felk.cvut.cz/wiki/courses/ae4m33mpv/start
3. http://cs.brown.edu/courses/cs143/
4. https://cw.fel.cvut.cz/wiki/courses/a4m33gvg/start

Course Code-Data Analytics
Type of Course :Professional Elective – 3.2

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:
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Course Objectives: The objective of this course is to provide knowledge of understanding the data, apply quantitative statistical analysis and data analytics on data, interpretation of results.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Conduct data analytics using appropriate descriptive and quantitative analysis on real-world problems.
CO2	Use data analytics skills like variance, ANOVA, regression techniques.
CO3	Understand the application of nearest neighbor classifiers and the effect of validation techniques on different datasets.
CO4	Apply unsupervised learning techniques for a given applications.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	3	2	-	-	-	-	-	-	2
CO2	3	3	3	3	2	-	-	-	-	-	-	2
CO3	2	3	2	3	2	-	-	-	-	-	-	2
CO4	3	3	2	3	2	-	-	-	-	-	-	2

UNIT I :

UNIT I:Descriptive Statistics: Introduction to the course for Data Analytics, Descriptive Statistics, Probability Distributions. Inferential Statistics: Inferential Statistics through hypothesis tests Permutation & Randomization Test.

UNIT II:

Regression & ANOVA: Regression, ANOVA (Analysis of Variance).Machine Learning: Introduction and Concepts, differentiating algorithmic and model based Frameworks Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression.

UNIT III:

K Nearest Neighbors Regression &Classification.Supervised Learning with Regression and Classification techniques -1: Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees.

UNIT IV:

Unsupervised Learning: Clustering, Associative Rule Mining. Prescriptive analytics: Creating data for analytics through designed experiments, creating data for analytics through Active learning.

TEXT BOOKS:

[1] Data Analytics Made Accessible by Anil K. Maheshwari, 2015

[2] Too Big to Ignore: The Business Case for Big Data by Phil Simon, 2013 by John Wiley & Sons, Inc.

[3] Data Mining and Business Analytics with R, by Johannes Ledolter, Publisher:Wiley (2013).
[4] An Introduction to Statistical Learning with Application in R, by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer (2013).

REFERENCE BOOKS:

[1] Hastie, Trevor, et al.; The elements of statistical learning. Vol. 2. No. 1. New York: Springer, 2009.
[2] Montgomery, Douglas C., and George C. Runger.; Applied statistics and probability for engineers. John Wiley & Sons, 2010.

E-RESOURCES:

[1]https://nptel.ac.in/content/syllabus_pdf/110106064.pdf
[2] https://swayam.gov.in/nd1_noc20_ma24/preview

Course Code-Software Testing Methodologies
Type of Course :Professional Elective – 3.3

Lecture – Tutorial- Practical:: 3-0-0
Credits: 3
Internal Marks: 40
External Marks: 60

Prerequisites:
Proper knowledge on software engineering and their concepts
Enough knowledge on object oriented modeling and techniques
Knowing the different types and levels of software testing process
Good programming skills and debugging skills

Course Objectives:
Describe the principles and procedures for designing test cases
Provide supports to debugging methods
Acts as the reference for software testing techniques and strategies

Course Outcomes:
Upon successful completion of the course, the student will be able to:

CO1	Able To Understand Basic Testing Concepts, Testing Techniques And Strategies
CO2	Have Basic Understanding And Knowledge Of Contemporary Issues Like Component And Interface Testing.
CO3	Able To Support In Generating Test Cases And Test Suites
CO4	Have Basic Understanding And Knowledge About Graphs And Matrix Relations, Apply Testing Methods And Tools

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	3	2	-	-	-	-	-	3	2	-	-
CO2	-	-	3	-	3	-	-	-	2	2	-	2
CO3	3	-	3	-	-	-	2	2	-	-	-	-
CO4	2	2	2	-	3	-	-	-	3	2	-	2

UNIT I :
Introduction: Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs,Taxonomy of Bugs.
Flow graphs and Path testing: Basics Concepts of Path Testing, Predicates, Path Predicates andAchievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.
Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques

UNIT II:
Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application ofDataflow Testing.
Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability.
Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.
UNIT III:

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips.
Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

UNIT IV:

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.
Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.
Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter.

TEXT BOOKS:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7. Win Runner in simple steps by Hakeem Shittu, 2007Genixpress.
8. Foundations of Software Testing, D.Graham& Others, Cengage Learning

E-RESOURCES:

Websites
1. Software Testing Training Adwww.talentedge.in/Software-Testing
2. Software Test Techniques www.webcrawler.com
3 Winrunner Testing Tool 4 Performance Testing With JMeter 2.9
e books :
1. Software Testing Tools: Covering Win Runner, Silk Test, ... Dr. K.V.K.K. Prasad - 2004 –
2. Software Testing: Testing SoftwareGerald D. Everett, Raymond McLeod, Jr. – 2007
3.Introducing Software Testing Tamres

Course Code- Cloud Computing and Application Development
Type of Course :Professional Elective – 3.4

Lecture – Tutorial- Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:
1.Basics of Computer Architecture and Organization
2.Basic OS and Networking concepts
3.Data Structures and Algorithms

Course Objectives:
1. Basics of cloud computing.
2. Key concepts of virtualization.
3. Different Cloud Computing services
4. Cloud Implementation, Programming and Mobile cloud computing
5. Key components of Amazon Web Services
6. Cloud Backup and solutions

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Able to understand distributed systems models and cloud platforms, virtualization levels and types.
CO2	To know the design principles, architectures, and enabling technologies of cloud platform, and Assessment of MapReduce, BigTable, Twister, Dryad, DryadLINQ, Hadoop, Sawzall, and Pig Latin
CO3	Use public cloud like IBM Bluemix, Amazon AWS, Google cloud platform or Microsoft Azure for developing an application
CO4	Work with real cloud services

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-

UNIT I :

Systems modeling, Clustering and virtualization:
Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency

Virtual Machines and Virtualization of Clusters and Data Centers:
Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms,

Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT II:

Cloud Platform Architecture:

Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

Cloud Programming and Software Environments:

Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

UNIT III:

Cloud Based Applications : developing web service, Understanding cloud ecosystem- SaaS/PaaS, Popular APIs

Designing Code for The Cloud: Designing cloud infrastructure; Web Browsers and the Presentation Layer- Understanding Web browsers attributes and differences. Building blocks of the presentation layer: HTML, HTML5, CSS, Silver-light, flash, java script, JQuery, Boot Strap

Web Development Techniques and Frameworks: Working with AJAX controls, JQuery, JSON, XML, REST. Working on Application development Frameworks e.g. Ruby on Rails ,.Net, Java API's or JSF; Deployment Environments – Platform As A Service(PAAS) ,Amazon, vmForce, Google App Engine, Azure, Heroku, AppForce

UNIT IV:

Developing and Deploying an Application in the real cloud : Building on the experience of the first project students will study the design, development, testing and deployment of an application in the cloud using a development framework and deployment platform

Using real cloud services: Working with compute, Data intensive services, load balancing and scaling services available on real cloud platforms

TEXT BOOKS:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Chris Hay, Brian Prince, "Azure in Action" Manning Publications [ISBN: 978-1935182481],2010.
4.Eugene Ciurana, "Developing with Google App Engine" Apress; 1 edition[ISBN: 978-1430218319],2009

REFERENCE BOOKS:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen
vecctiola, S Tammaraiselvi, TMH

E-RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105167/
2. https://nptel.ac.in/courses/106104182/
3. https://www.coursera.org/learn/cloud-applications-part1/home/welcome

Course Code-NATURAL LANGUAGE PROCESSING

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: :

Data structures, finite automata and probability theory

Course Objectives:

Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.

CO2 Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems

CO3 Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.

CO4 Able to design, implement, and analyze NLP algorithms

CO5 Able to design different language modeling Techniques.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	3	-	2	-	-	-	-	-	-	-	3	3	2
CO2	2	3	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	-	2	2	2	3	-	-	-	-	-	-	-	2	-	2
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	2	2

CO5	-	2	2	3	3	-	-	-	-	-	-	-	2	2	2

UNIT I :

Introduction to Natural Language Processing: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background:An outline of English syntax

UNIT II:

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Finite State Models and Morphological Processing, Grammars and Logic Programming., Augmented Transition Networks.

UNIT III:

mantics and Logical Form: Word senses and Ambiguity, Encoding Ambiguity in the Logical Form, Verbs and States in Logical Form, Speech Acts and Embedded Sentences, Defining Semantic Structure: Model Theory

UNIT IV:

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems,

TEXT BOOKS:

1.James Allen, "Natural Language Understanding", Pearson Education

2. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and ImedZitouni, Pearson Publication

3. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications

2. Christopher D Manning and HinrichSchutze, "Foundations of Statistical Natural Language Processing" MIT Press, 1999.

3. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice

E-RESOURCES:

1. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1

2. . http://www.nptelvideos.in/2012/11/natural-language-processing.html

Course Code- Augmented Reality & Virtual Reality

Lecture – Tutorial- Practical:: 3-0-0

Internal Marks: 40

Credits: 3

External Marks: 60

Prerequisites: Computer Graphics

Course Objectives: This course provides students with an opportunity to explore the research issue Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concept and framew of virtual reality.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Understand Basics of Augmented Reality and Interactions. Fundamentals of Augmented , Mixed Reality its features

CO2 Understand Basics of Virtual Reality and Interactions. Fundamental Concepts and Components of Vir Reality

CO3 Describe various input and output devices required for VR experience

CO4 Classify human factors that affect VR experience

CO5 Analyze the performance of various virtual reality applications.

CO6 Express the object position and orientation in virtual space.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	-	3	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	3	-	-	-	-	-	-	3	-	-

CO6	3	3	3	-	-	-	-	-	-	-	-	-	3	-	

UNIT I :

Introduction to Augmented Reality -Augmented Reality Interactions, Monitor Based Displays, Head-mour Displays, AR Interaction, AR Tracking , Augmented and Mixed Reality, Technology and features of augmen reality, Typical AR Experiences, Difference between AR and VR, Challenges with AR, AR systems

UNIT II:

Introduction to Virtual Reality- Historical development of VR Fundamental Concept and Components of Virt Reality, Primary Features and Present Development on Virtual Reality, The three I's of virtual reality, commercial technology and the five classic components of a VR system

UNIT III:

Input Devices: Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces
Output Devices: Graphics displays, sound displays & haptic feedback

UNIT IV:

Human Factors: Methodology and terminology, user performance studies, VR health and safety issu
Applications: Medical applications, military applications, robotics applications.
Virtual Space: Visual and object space, defining position and orientation in three dimensions
TEXT BOOKS:

1. Alan B. Craig, "Understanding Augmented Reality: Concepts and Applications", Newnes

2. William R. Sherman and Alan B. Craigm, "Understanding Virtual Reality " , Morgan Kaufmann Publishers

3. John Vince, "Virtual Reality Systems", Pearson Education.

4. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Hun Factors for AR and VR", Addison-Wesley.

REFERENCE BOOKS:

Gregory C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, John Wiley & Sc Inc.

2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", Springer-Verlag London 2005

E-RESOURCES:

1. http://www.vrac.iastate.edu/

2.http://www.hitl.washington.edu/projects/education/pf/whatvr1a.htm

3. https://learn.unity.com/course/create-with-code 4. https://www.wikitude.com/smart-augmented-reality/

4. https://www.coursera.org/learn/ar

5. https://www.coursera.org/learn/handheld-ar

Course Code- BLOCKCHAIN TECHNOLOGY

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

1. Knowledge in security and applied cryptography.

2. Knowledge in distributed databases.

›urse Objectives:

- To Introduce block chain technology and Crypto currency
- Discuss the fundamental ideas of Bit coin MOOCs.
- Identify the different components of the block chain process.
- Recognize the differences between block chain and bit coin and other crypto currencies.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Learn about research advances related to one of the most popular technological areas today.
CO2	Demonstrate the block-chain services to develop a New Paradigm of Organizational activities
CO3	Learn the limitations of the block-chain mechanism to develop an efficient organizational structure
O4	Applying Bit-Coin protocols and how to develop the digital currency in the websites

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	3	2	2	-	-	-	-	-	-	-	3	3	3

CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2

UNIT I :

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency wo Crowdfunding

UNIT II:

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockch Environment

UNIT III:

.ockchain Science: Gridcoin, Foldingcoin, Blockchain Genomics, Bitcoin MOOCs.Currency, Token, Tokenizi Campuscoin, Coin drop as a strategy for Public adoption.

UNIT IV:

Currency Multiplicity, Demurrage currency.
Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

TEXT BOOKS:

1. Blockchain Blue print for Economy by Melanie Swan

REFERENCE BOOKS:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

E-RESOURCES:

1. Blockchain | Tools, Publications & Resources (ala.org)
2. Blockchain Learning Hub | UNICEF Office of Innovation

Course Code- INTELLIGENT SYSTEMS

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:**

Credits: 3 **External Marks:**

Prerequisites: NIL

Course Objectives:

This course is used to provide the description of agents and various types of agents and how they used to solve vari AI problems. This gives a clear view of analyzing AI problems, types of problems techniques of solving problems gives a clear view of knowledge, representation of knowledge, types of logic and its algorithms. It provides a be understanding of uncertainty and certainty, its factors various theories of uncertainty and appropriate examples.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Explore various Artificial Intelligence problem solving techniques.

CO2 Identify and describe the different AI approaches such as Knowledge representation, Search strateg learning techniques to solve uncertain imprecise, stochastic and nondeterministic nature in AI problems

CO3 Apply the AI techniques to solve various AI problems.

CO4 Analyze and compare the relative challenges pertaining to design of Intelligent Systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	2	-	-	2	2	-	-	3	-	-	2	2	-
CO2	2	-	-	-	-	-	-	3	-	3	-	-	2	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	3	-
CO4	-	-	-	3	-	-	3	-	-	-	3	-	-	3

UNIT I : Overview of Artificial Intelligence

Artificial Intelligence and its Application areas; Knowledge Representation and Search: The Predicate Calculus: Propositional Calculus, The Predicate Calculus, Using Inference Rules to Produce Predicate Calculus Expressic Application: A Logic-Based Financial Advisor; Structures and strategies for state space search: Introducti

Structures for state space search ,Strategies for State Space Search, Using the State Space to Represent Reasor with the Predicate Calculus; And/or Graphs

UNIT II: Searching

Heuristic Search: Introduction, Hill Climbing and Dynamic Programming, The Best-First Search Algorit Admissibility, Monotonicity and Informedness, Using Heuristics in Games, Complexity Issues. Control Implementation of State Space Search: Introduction, Recursion-Based Search, Production Systems, The Blackbo Architecture for Problem Solving.

UNIT III: Other Knowledge Representation Techniques

Semantic Networks, Conceptual Dependencies, Scripts and Frames, Conceptual Graphs. Knowledge Intens Problem Solving: Overview of Expert System Technology, Rule-Based Expert Systems, Model-Based, Case Bas and Hybrid Systems Planning: Introduction to Planning, Algorithms as State-Space Search, Planning graphs

UNIT IV: Automated Reasoning

ıntroduction to Weak Methods in Theorem Proving, The General Problem Solver and Difference Tables, Resolut Theorem Proving; Uncertain Knowledge and Reasoning: Introduction to Uncertainty, Inference using Full-J Distribution, Independence, Bayes' Rule and its use. Representing Knowledge in Uncertain Domain: Semantics Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Netwo Approximate Inference in Bayesian Network

TEXT BOOKS:

1. Elaine Rich, Kevin Knight and ShivashankarB.Nair, —Artificial Intelligence‖, TMH, Third edition, 2009.
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003.
3. N. P. Padhy, —Artificial Intelligence and Intelligent System, Oxford University Press, Second edition, 2005

REFERENCE BOOKS:

1. Artificial Intelligence A Modern Approach, Stuart Russel, Peter Norvig, 3rd Edition, Pearson Publication, 2015, ISBN-13: 978-93-325-4351-5
2. Artificial Intelligence, Elaine Rich, Kevin Knight, 3 rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709, ISBN-13: 978-0070087705
3. Artificial Intelligence – Structures and Strategies for Complex problem Solving, George F Luger, 6th Editio Pearson Publication, 2009, ISBN-10: 0-321-54589-3, ISBN-13: 978-0-321-54589-3
4. Intelligent Systems-A Modern Approach, Grosan, Crina, Abraham, Ajith, Springer-Verlag Berlin Heidelber 2011, ISBN 9783642269394, 2011.

E-RESOURCES:

1. www.nptel.ac.in

2. https://www.britannica.com/technology/artificial-intelligence

3. https://www.tutorialspoint.com / Artificial Intelligence / AI – Overview

Course Code-Real Time Systems

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Computer Organization and Operating System, Microprocessor& Microcontroller

Course Objectives:

To provide broad understanding of the requirements of Real Time Operating Systems.

To make the student understand, applications of these Real Time features

Course Outcomes:

CO1	Understand concepts of Real time Systems and commands
CO2	Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt,latency and response time, and semaphores.
CO3	Discuss how tasks can communicate using semaphores, mailboxes, and queues.
CO4	Be able to explain how the real-time operating system implements time management.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	2	2	2	--	2	--	--	--	--	--	--	--	2	2	2
CO2	3	2	2	--	2	--	--	--	--	--	--	--	--	2	--
CO3	3	2	3	--	--	--	--	--	--	--	--	--	2	2	2
CO4	2	2	2	--	2	--	--	--	--	--	--	--	2	2	2

UNIT I :

Introduction

Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write),

Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT II:

Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, defining a Task, asks States and Scheduling, Task Operations, Structure,Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage Operations and Use

UNIT III:

Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT IV:

Exceptions, Interrupts and Timers

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers.

TEXT BOOKS:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.

2. Advanced UNIX Programming, Richard Stevens

3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

E-RESOURCES:

1. https://www.guru99.com/real-time-operating-system.html
2. https://www.tutorialspoint.com/Real-Time-Embedded-Systems
3. https://nptel.ac.in/courses/106/105/106105036/

COURSE CODE- DATA SCIENCE

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	4
Credits:	3	**External Marks:**	6

Prerequisites: Linear Algebra, Descriptive Statistics, Data Mining, Python, R

Course Objectives: To learn the fundamentals of Data Science, Data Extraction and Pre-Processing Meth Model Development, and Evaluation with Descriptive Statistics.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Able to learn fundamentals of Data Science.

CO2 Understanding different Data collection and Pre-Processing methods.

CO3 Understanding the use of various Descriptive Statistics.

CO4 Analyzing various Data analytics techniques.

CO5 Use of Regression Techniques.

CO6 Evaluation of Various Models.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PS 3
CO1	3	2	2	2	2	2	--	--	--	--	--	--	2	2	3
CO2	2	2	3	2	2	--	--	--	--	--	--	--	2	2	2
CO3	2	2	3	2	2	--	--	--	--	--	--	--	3	3	2
CO4	3	3	2	3	3	3	--	--	--	--	--	--	2	3	2
CO5	3	3	2	3	3	3	--	--	--	--	--	--	2	3	2
CO6	2	2	2	3	3	3	--	--	--	--	--	--	2	3	3

UNIT I: INTRODUCTION TO DATA SCIENCE

Introduction to Data Science: Evolution of Data Science, Data Science Roles, Stages in a Data Science Pro Applications of Data Science in various fields, Data Security Issues.

UNIT II: Data Collection and Data Pre-Processing

Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, I Reduction, Data Discretization.

UNIT III: Descriptive Statistics and Exploratory Data Analytics

Mean, Standard Deviation, Skewness, Kurtosis, Correlation, ANOVA, Box Plot, Histogram, Scatter Plot, Multi-v chart, Pivot Table, Heat Map.

UNIT IV: Model Development and Evaluation

Regression Techniques: Linear, Multiple, K-Means.Evaluation Techniques: Precision, Recall, F1-Score, R-Squ MAE, MSE, RMS, Residual Plots, Distribution Plots, Cross-Validation, Prediction.

TEXTBOOKS:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science," PACKT, 2016.

2. Cathy O'Neil and Rachel Schutt, "Doing Data Science," O'Reilly, 2015.

3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

4. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics," IGI Global

REFERENCE BOOKS:

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics," IGI Global

E-RESOURCES:

1. https://nptel.ac.in/courses/106/106/106106179/
2. https://www.coursera.org/browse/data-science
3. https://swayam.gov.in/explorer

COURSE CODE- HIGH PERFORMANCE COMPUTING

Lecture – Tutorial- Practical::	**3**	**0**	**0**	**Internal Marks:**	40
Credits:3	**03**			**External Marks:**	60

Prerequisites:

Course Objectives:

The main objective of this course is to make the students familiar with High Performance Computing Principles and its environment.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze the functionality of Modern Processor.
CO2	Comprehend and implement various optimization techniques for serial code.
CO3	Design the concept of parallel computing and Programming.
CO4	To study about memory parallel programming using open MP and MPI

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	--	--	2	--	--	--	2	--	--	--	--	2	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--
CO3	2	--	--	--	--	2	--	--	--	2	--	-	2	--	--
CO4	--	2	--	--	3	--	--	2	--	--	--	--	--	--	2

UNIT I : Modern Processors: Stored Program Computer Architecture, Architecture of microprocessor based on cache- Performance based metrics and benchmarks, Moore's Law, Pipelining, Super scalarity, SIMD, Different classes of Memory- cache, mapping, pre-fetch ,Introduction to different types of processor such as Multicore processors, Multithreaded processors, Vector Processors

STRUCTURE FOR SECOND YEAR B.TECH (AI&ML) PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	20A210021	Vector Calculus, Transform techniques and Partial differential equations	3	0	0	3	30	70	100	3
2	20A2105401	Python Programming	3	0	0	3	30	70	100	3
3	20A2105402	Data Base Management Systems	3	0	0	3	30	70	100	3
4	20A2105403	Computer organization and architecture	3	0	0	3	30	70	100	3
5	20A2161401	Statistical Foundations of Artificial Intelligence	3	0	0	3	30	70	100	3
6	20A2105491	Python programming Lab	0	0	3	3	15	35	50	1.5
7	20A2105492	Data Base Management System Lab	0	0	3	3	15	35	50	1.5
8	20A2161491	Digital Logic Design Lab	1	0	2	3	15	35	50	1.5
9	20A2161992	Mobile Application Development Lab	0	0	4	4	15	35	50	2
	20A2100802	Professional ethics and Human Values	0	2	0	2	30	70	100	0
Total			15	0	13	28	240	560	800	21.5

STRUCTURE FOR SECOND YEAR B.TECH (AI&ML) PROGRAMME

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2242401	Introduction to Machine Learning	3	0	0	3	30	70	100	3
5	20A2205404	Formal languages and automata theory	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2242491	Machine Learning with python Lab	0	0	3	3	15	35	50	1.5
9	20A2261991	NLP with python lab	0	0	4	4	15	35	50	2
Total			15	0	13	28	210	490	700	20.5
Internship 2 Months (Mandatory) during summer vacation										
Honors/Minor courses -1 (The hours distribution can be 3-0-2 or 3-1-0 also)			4	0	0	4				

Head, CSE Department
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HOD

డిపార్ట్‌మెంట్ ఆఫ్ కంప్యూటర్ సైన్స్ అండ్ ఇంజినీరింగ్

రెండవ సంవత్సరం B.TECH ప్రోగ్రామ్ కోసం నిర్మాణం

II సంవత్సరం I సెమిస్టర్

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

క్ర.సం. సం	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	స్కీమ్ ఆఫ్ ఇన్‌స్ట్రక్షన్ (వారానికి పీరియడ్స్)				పరీక్షా విధానం (గరిష్ట మార్కులు)			క్రెడిట్ల సంఖ్య
			ఎల్	టి	పి	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A2100201	వెక్టర్ కాలిక్యులస్, ట్రాన్స్‌ఫార్మ్ టెక్నిక్స్ మరియు పార్షియల్ డిఫరెన్షియల్ ఈక్వేషన్స్	3	0	0	3	30	70	100	3
2	20A2105401	పైథాన్ ప్రోగ్రామింగ్	3	0	0	3	30	70	100	3
3	20A2105402	డేటా బేస్ మేనేజ్‌మెంట్ సిస్టమ్స్	3	0	0	3	30	70	100	3
4	20A2105403	కంప్యూటర్ ఆర్గనైజేషన్ మరియు ఆర్కిటెక్చర్	3	0	0	3	30	70	100	3
5	20A2105404	ఇంటర్నెట్ ఆఫ్ థింగ్స్	3	0	0	3	30	70	100	3
6	20A2105491	పైథాన్ ప్రోగ్రామింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A2105492	డేటా బేస్ మేనేజ్‌మెంట్ సిస్టమ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
8	20A2105493	ఇంటర్నెట్ ఆఫ్ థింగ్స్ ప్రయోగశాల	0	0	3	3	15	35	50	1.5
9	20A2105292	ఫుల్ స్టాక్‌ని ఉపయోగించి వెబ్ అప్లికేషన్ డెవలప్‌మెంట్ - ఫ్రంటెండ్ డెవలప్‌మెంట్ - మాడ్యూల్ - I	0	0	4	4	15	35	50	2
10	20A2105691	ఆప్టిట్యూడ్ మరియు రీజనింగ్	0	2	0	2	15	35	50*	0
మొత్తం			15	2	13	30	225	525	750	21.5

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Transform Techniques and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2105401	Python Programming	3	0	0	3	30	70	100	3
3	20A2105402	Data Base Management Systems	3	0	0	3	30	70	100	3
4	20A2105403	Computer Organization and Architecture	3	0	0	3	30	70	100	3

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5	20A2105404	Internet of Things	3	0	0	3	30	70	100	3
6	20A2105491	Python programming Lab	0	0	3	3	15	35	50	1.5
7	20A2105492	Data Base Management System Lab	0	0	3	3	15	35	50	1.5
8	20A2105493	Internet of Things Lab	0	0	3	3	15	35	50	1.5
9	20A2105992	Web Application Development Using Full Stack – Frontend Development – Module - I	0	0	4	4	15	35	50	2
10	20A2105901	Aptitude and Reasoning	0	2	0	2	15	35	50*	0
Total			**15**	**2**	**13**	**30**	**225**	**525**	**750**	**21.5**

II సంవత్సరం II సెమిస్టర్

క్ర.సం. సం	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	స్కీమ్ ఆఫ్ ఇన్‌స్ట్రక్షన్ (వారానికి పీరియడ్స్)				పరీక్షా విధానం (గరిష్ట మార్కులు)			క్రెడిట్స్ సంఖ్య
			ఎల్	టి	పి	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A2200201	సంభావ్యత మరియు గణాంకాలు	3	0	0	3	30	70	100	3
2	20A2205401	వెబ్ టెక్నాలజీస్	3	0	0	3	30	70	100	3
3	20A2205402	సాఫ్ట్‌వేర్ ఇంజనీరింగ్	3	0	0	3	30	70	100	3
4	20A2205403	ఆపరేటింగ్ సిస్టమ్స్	3	0	0	3	30	70	100	3
5	20A2205404	ఫార్మల్ లాంగ్వేజ్ మరియు ఆటోమాటా సిద్ధాంతం	3	0	0	3	30	70	100	3
6	20A2205491	వెబ్ టెక్నాలజీస్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A2205492	సాఫ్ట్‌వేర్ ఇంజనీరింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
8	20A2205493	ఆపరేటింగ్ సిస్టమ్స్ మరియు Unix ప్రోగ్రామింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
9	20A2205991	ప్రైథాన్-సంఖ్య, పాండాస్ అప్లికేషన్స్	0	0	4	4	15	35	50	2
10	20A2200502	వృత్తిపరమైన నీతి మరియు మానవ విలువలు	0	2	0	2	30	70*	100	0
మొత్తం			**15**	**2**	**13**	**30**	**240**	**560**	**800**	**21.5**

*** అంతర్గత మూల్యాంకనం**

L - లెక్చర్ T – ట్యుటోరియల్ - ప్రాక్టికల్
CIA – నిరంతర అంతర్గత అంచనా SEA – సెమిస్టర్ ముగింపు అంచనా

Int e r n sh i p 2Mo n ths (M a ndator y) du ring s u m mer vaca t ion				
H onor s / M inorcou rs es (h o u rs d ist r ibu t ion 3 -0-2 లేదా 3 -1-0a l s o కావచ్చు)	**4**	**0**	**0**	**4**

HOD
Head, Computer Science & Engineering
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl.), Krishna Dist.

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2205403	Operating Systems	3	0	0	3	30	70	100	3
5	20A2205404	Formal Languages and Automata theory	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2205493	Operating Systems and Unix Programming Lab	0	0	3	3	15	35	50	1.5
9	20A2205991	Applications of Python-Numpy, Pandas	0	0	4	4	15	35	50	2
10	20A2200802	Professional ethics and Human Values	0	2	0	2	30	70*	100	0
Total			15	2	13	30	240	560	800	21.5

* Internal Evaluation

L - LECTURE T – TUTORIAL P - PRACTICAL
CIA – Continuous Internal Assessment SEA – Semester End Assessment

Internship 2Months (Mandatory) during summer vacation				
Honors/Minorcourses (The hours distribution can be3-0-2or3-1-0also)	4	0	0	4

డిపార్ట్‌మెంట్ ఆఫ్ కంప్యూటర్ సైన్స్ అండ్ ఇంజినీరింగ్

మూడవ సంవత్సరం B.TECH ప్రోగ్రామ్ కోసం ఉద్దేశించిన నిర్మాణం

Head, CSE Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl.), Krishna Dist.

NRI INSTITUTE OF TECHNOLOGY

AUTONOMOUS

Accredited : NAAC with "A", NBA (CSE, ECE & EEE)

Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada

Pothavarappadu, Agiripalli Mandalam, Krishna Dt., Andhra Pradesh - 521212

URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nriit.edu.in

DEPARTMENT OF INFORMATION TECHNOLOGY

PRPOPSED STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR II SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2200201	Probability and Statistics	3	0	0	3	30	70	100	3
2	20A2205401	Web Technologies	3	0	0	3	30	70	100	3
3	20A2205402	Software Engineering	3	0	0	3	30	70	100	3
4	20A2205403	Operating Systems	3	0	0	3	30	70	100	3
5	20A2205404	Formal Languages and Automata theory	3	0	0	3	30	70	100	3
6	20A2205491	Web Technologies Lab	0	0	3	3	15	35	50	1.5
7	20A2205492	Software Engineering Lab	0	0	3	3	15	35	50	1.5
8	20A2205493	Operating Systems and Unix Programming Lab	0	0	3	3	15	35	50	1.5
9	20A2205991	Applications of Python-Numpy, Pandas	0	0	4	4	15	35	50	2
10	20A2200802	Professional ethics and Human Values	0	2	0	2	30	70*	100	0
Total			**15**	**2**	**13**	**30**	**240**	**560**	**800**	**21.5**

*** Internal Evaluation**

L - LECTURE T – TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

Internship 2Months (Mandatory) during summer vacation				
Honors/Minorcourses (The hours distribution can be3-0-2or3-1-0also)	**4**	**0**	**0**	**4**

Head, IT Department
NRI Institute of Technology
POTHAVARAPPADU (V)
Agiripalli (M), Krishna Dist

NRI INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF INFORMATION TECHNOLOGY

STRUCTURE FOR SECOND YEAR B.TECH PROGRAMME

II YEAR I SEMESTER

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P	Total	CIA	SEA	Total	
1	20A2100201	Vector calculus, Transform Techniques and Partial Differential Equations	3	0	0	3	30	70	100	3
2	20A2105401	Python Programming	3	0	0	3	30	70	100	3
3	20A2105402	Data Base Management Systems	3	0	0	3	30	70	100	3
4	20A2105403	Computer Organization and Architecture	3	0	0	3	30	70	100	3
5	20A2105404	Internet of Things	3	0	0	3	30	70	100	3
6	20A2105491	Python programming Lab	0	0	3	3	15	35	50	1.5
7	20A2105492	Data Base Management System Lab	0	0	3	3	15	35	50	1.5
8	20A2105493	Internet of Things Lab	0	0	3	3	15	35	50	1.5
9	20A2105992	Web Application Development Using Full Stack – Frontend Development – Module - I	0	0	4	4	15	35	50	2
10	20A2105901	Aptitude and Reasoning	0	2	0	2	15	35	50*	0
Total			**15**	**2**	**13**	**30**	**225**	**525**	**750**	**21.5**

Head, IT Department
NRI Institute of Technology
POTHAVARAPPADU (V)
Agiripalli (M), Krishna Dist

20A2100201: Vector Calculus, Transform Techniques and Partial Differential Equations

Lecture	3	**Internal Marks:**	30
Tutorial	0		
Credits	3	**External Marks:**	70

Course Objectives:

- To familiarize the techniques in partial differential equations
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world application

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Interpret the physical meaning of different operators such as gradient, cur land divergence (L5)
CO2	Estimate the work done against a field, circulation and flux using vector calculus (L5)
CO3	Apply the Laplace transform for solving differential equations (L3)
CO4	Find or compute the Fourier series of periodic signals (L3)
CO5	Knowandbe able to apply integral expressions for the forwards and inverse Fourier transform to arrange of non-periodic wave forms (L3)
CO6	Identify solution methods for partial differential equations that model physical processes (L3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	-
CO6	3	3	2	2	-	-	-	-	-	-	-	-

UNIT I

Unit–I: Vector calculus:
Vector Differentiation: Gradient –Directional derivative–Divergence–Curl–Scalar Potential. Vector Integration: Line integral–Work done–Area–Surface and volume integrals.
Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)

UNIT II

Unit–II: Laplace Transforms:
Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Inverse Laplace transforms– Convolution theorem (without proof).
Applications:
Solving ordinary differential equations (initial value problems) using Laplace transforms

UNIT III

about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.

c) Write a Java program that displays the number of characters, lines and words in a text file.

Exercise 5

Create an inheritance hierarchy of Rodent, Mouse, Gerbil, Hamster etc. In the base class provide methods that are common to all Rodents and override these in the derived classes to perform different behaviors, depending on the specific type of Rodent. Create an array of Rodent, fill it with different specific types of Rodents and call your base class methods

Exercise 6

(a) Write a java program to create an abstract class named Shape that contains an empty method named numberOfSides ( ).Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes extends the class Shape. Each one of the classes contains only the method numberOfSides ( ) that shows the number of sides in the given geometrical figures.

(b) Write a Java program that demonstrates Packages

Exercise 7

a) Write a Java program demonstrating the life cycle of a thread.

b) Develop an applet that displays a simple message

Exercise 8

a) Develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

b) Write a Java program that allows user to draw lines, rectangles and ovals.

Exercise 9

a) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

b) Write a Java program for handling mouse events.

Exercise 10

a) Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

b) Write a Java program that lets users create Pie charts. Design your own user interface (with Swings & AWT)

TEXT BOOKS:

1. The Complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object oriented Application Development, R. A. Johnson, Cengage Learning.

E-RESOURCES:

http://www.javatpoint.com/
java.sun.com/docs/books/tutorial/java/TOC.html
http://www.learnjavaonline.org/
http://www.tutorialspoint.com/java/
www.java.com/en/download/faq/develop.xml
www.oracle.com › Java › Java SE
www.w3schools.com

Unit–III: Fourier series and Fourier Transforms:

Fourier Series:

Introduction – Periodic functions – Fourier series of periodic function –Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms:

Fourier integral theorem (without proof) –Fourier sine and cosine integrals –Sine and cosine transforms – inverse trans forms –Finite Fourier transforms

UNIT IV

Unit–IV: PDE of first order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

UNIT: V

UNIT-V:Second order PDE:

Second order PDE: Solutions of linearpartial differential equations with constant coefficient – term of the typee^{ax+by}, $sin(ax + by)$, $cos(ax + by)$, $x^m y^n$.

Method of separation of variables – introduction.

TEXT BOOKS:

1B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. B.V.Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education

REFERENCE BOOKS:

1. ErwinKreyszig, Advanced Engineering Mathematics, 10thEdition, Wiley-India.
2. Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rdEdition, CRC Press.
3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.
4. Srimantha Pal, SCBhunia, Engineering Mathematics, Oxford University Press

E-RESOURCES:

1. **www.nptel**videos.com/mathematics/ (Math Lectures from MIT, Stanford,IIT'S)
2. nptel.ac.in/courses/122104017
3. nptel.ac.in/courses/111105035

20A2105401-Python Programming

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	
Credits:	3	**External Marks:**	

Prerequisites:

Adequate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

Course Objectives:

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries.

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO 1	Experience with an interpreted Language and to build software for real needs
CO 2	Use basic Decision structures, Boolean logic, variable types, assignments and operators.
CO 3	Describe and use of Python lists, dictionaries, tuples and sets.
CO 4	Implement methods and functions to improve readability of programs
CO 5	Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO 1	3	--	--	--	3	--	--	--	3	--	3	--	3	3
CO 2	--	3	2	--	--	--	--	--	--	--	--	--	2	3
CO 3	--	--	--	2	3	--	--	--	3	--	--	--	3	3

CO 4	--	--	--	3	3	--	--	--	3	--	--	--	2	3	
CO 5	--	--	--	3	--	--	--	--	--	--	3	--	3	3	3

UNIT I : DATA, EXPRESSIONS, STATEMENTS

Python Interpreter and Interactive mode; Values and Types: int, float, boolean, string, and list; Variables, Expressions, Statements, Tuple assignment, Precedence of operators, Comments; Modules and Functions, Function Definition and use, Flow of Execution, Parameters and Arguments; Illustrative programs: Exchange the values of two variables, Distance between two points.

UNIT II: CONTROL FLOW, FUNCTIONS.

Conditionals: Boolean values and operators, Conditional (if), Alternative (if-else), Chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, sum an array of numbers, Linear search, Binary search

UNIT III: LISTS, TUPLES, DICTIONARIES

Lists: List operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning lists, List parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: selection sort, insertion sort, mergesort.

UNIT IV: FILES, MODULES, PACKAGES AND EXCEPTION HANDLING

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

UNIT V:CLASSES AND OBJECTS

Implementation of classes and objects in Python: Classes and Objects, Methods and Self Argument, The __init_Method, Class Variables and Object Variables, The __del_Method, Public and Private Data Members, Private Methods,Built-in Functions to Check, Get, Set and Delete Class Attributes, Garbage Collection (Destroying Objects)

TEXT BOOKS:

1.Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

REFERENCE BOOKS:

Think Python , Allen Downey , Green Tea Press

E-RESOURCES:

https://www.tutorialspoint.com/python/index.htm

https://www.programiz.com/python-programming

https://www.w3schools.com/python/

https://www.javatpoint.com/python-tutorial

20A2105402-DATA BASE MANAGEMENT SYSTEMS

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Basic Database,Data Structures, Mathematics

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- Learn and practice data modelling using the entity-relationship and developing database designs
- To master the basics of SQL and construct queries using SQL.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access
- Learn the concepts of transaction management and how they provide security and consistency
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Ability to define, understand the database management system structure
CO2	Ability to apply as relational algebra to find solutions to a broad range of queries.
CO3	Ability to create applications using various normal forms, functional dependencies, validating and identifying anomalies
CO4	Will be able to explain the principle of transaction management design.
CO5	Understands and applies indexing mechanisms in databases

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	--	2	--	--	--	--	--	--	2	2	2	2
CO2	3	3	3	--	--	--	--	--	--	--	2	2	2	2	2
CO3	3	3	--	--	3	2	--	--	--	--	2	2	3	2	2
CO4	2	2	3	--	2	2	--	--	--	--	2	3	2	2	2
CO5	3	3	3	--	2	3	--	--	--	--	2	2	2	2	2

UNIT I :

DATABASE SYSTEM APPLICATIONS:

Database System Applications, Purpose of Database Systems, File Systems versus a DBMS, View of Data – Data Abstraction, Instances and Schemas, Data Models, Data Independence, Database Users and Administrators,

Structure of a DBMS.

INTRODUCTION TO DATABASE DESIGN:

Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT II:

INTRODUCTION TO THE RELATIONAL MODEL:

Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, Destroying/altering tables and views.

RELATIONAL ALGEBRA AND CALCULUS:

Relational Algebra – Selection and Projection, Set operations,Renaming, Joins,Division,Examples of Algebra Queries, Relational calculus – Tuple relationalCalculus – Domain relational calculus.

UNIT III:

SQL: QUERIES, CONSTRAINTS, TRIGGERS:

Form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, Triggers and active data bases.

SCHEMA REFINEMENT:

Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal Form.

UNIT IV:

OVERVIEW OF TRANSACTION MANAGEMENT:

The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions – Lock Based Concurrency Control, Deadlocks –Performance of Locking – Transaction Support in SQL.

CONCURRENCY CONTROL:

Serializability, and recoverability – Introduction to Lock Management – Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques – Concurrency Control without Locking.

CRASH RECOVERY:

Introduction to Crash recovery, Introduction to ARIES, the Log, and Other Recovery related Structures, theWrite-Ahead Log Protocol, Check pointing, recovering from a System Crash, Media recovery.

UNIT V:

OVERVIEW OF STORAGE AND INDEXING:

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and

Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishnan, Johannes Gehrke, TMH, 3rd Edition,2003.

2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan,McGraw hill, VI edition,2006.

3. Fundamentals of Database Systems 5th edition., Ramez Elmasri, Shamkant .Navathe,Pearson Education,2008.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

2. Fundamentals of Database Systems, Elmasri Navrate, *Pearson Education*

3. Introduction to Database Systems, C. J. Date, *Pearson Education*

4. Oracle for Professionals, The X Team, S.Shah and V. Shah, *SPD.*

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, *PHI.*

6. Fundamentals of Database Management Systems, M. L. Gillenson, *Wiley Student* Edition.

E-RESOURCES:

1. https://www.javatpoint.com/dbms-tutorial

2. https://www.tutorialspoint.com/dbms/index.htm

3.https://www.geeksforgeeks.org/dbms/

20A2105403- Computer Organization and Architecture

Lecture – Tutorial- Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

NIL

Course Objectives:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binarycode.
- To study the combinational logic design of various logic and switching devices and theirrealization
- Understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- The memory organization of the computer and input output organization understanding

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the numeric information in different forms and interpret different logic gates.
CO2	Analyze and Design various combinational circuits like Encoders, Decoders, Multiplexers, De-multiplexers, and Arithmetic Circuits.
CO3	Able to understand the basic components and the design of CPU, ALU and Control unit
CO4	Students can calculate the effective address of an operand by addressing modes
CO5	Ability to understand memory hierarchy and its impact on computer cost/performance..
CO6	Ability to understand the advantage of instruction level parallelism.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO
CO1	2	-	2	2	--	--	--	--	--	--	--	--	2	--	2
CO2	3	--	3	--	3	--	--	--	--	--	--	--	--	3	--
CO3	--	--	2	2	2	--	--	--	--	--	--	--	--	--	3
CO4	--	--	2	3	3	--	--	--	--	--	--	--	--	2	--
CO5	--	--	3	2	--	--	--	--	--	--	--	2	2	3	--
CO6	--	--	--	2	2	--	--	--	--	--	--	--	3	2	--

UNIT I :

NUMBER SYSTEMS & BOOLEAN FUNCTIONS: Representation of numbers in different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed numbers,Boolean theorems, principle of complementation & duality, De-Morgans theorems, Basic logic gates and Universal gates, NAND-NAND and NOR-NOR realizations, Standard SOP and POS.

UNIT II:

Design of Half adder, full adder half subtractor, full subtractor, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, 4 bit parallel adder, Carry look-a- head adder circuit. Decoders, Encoders, priority encoder, Multiplexer, Demultiplexer. Basic Structure Of Computers : Computer Types, Functional unit, Basic Operational concepts, Bus structures, Software, Performance.

UNIT III:

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and memory Transfers, Arithmetic Micro-operations, Logic Microoperations, Shift Micro-operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction codes, Computer Registers,Computer Instructions, Timing and Control, Instruction cycle, Memory ReferenceInstructions, Input-Output and Interrupts

UNIT IV:

Central Processing Unit: General register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC).Computer Arithmetic : Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations.

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.Input Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA)

TEXT BOOKS:

1 Morris M. Mano, Computer Systems Architecture.3 Ed, Pearson/PHI, 2013

2 Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

REFERENCE BOOKS:

John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998.

E-RESOURCES:

https://www.tutorialspoint.com/computer_organization/index.asp

https://www.geeksforgeeks.org/computer-organization-basic-computer-instructions/

20A2105404- INTERNET OF THINGS

Lecture - Tutorial- Practical:: 3-0-0 **Internal Marks**

Credits: 3 **External Marks**

Prerequisites: Python programming

Course Objectives:

The objective of this course is to explore the interconnection and integration of the physical world and the cyber space. Understand the design concepts in setting up IOT Devices. Study about the setup, configuration and installation of equipment for IOT.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand Device-processor communication models & protocols.
CO2	Understand the application areas of IOT.
CO3	Visualize the effect of internet on Mobile Devices, Cloud & Sensor Networks.
CO4	Acquire programming experience with Raspberry Pi kit to interface various devices.
CO5	Implement Programming models for IoT Cloud Environment.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	2	2	--	--	2	--	--	--	2	--	--	--	2
CO2	--	--	--	2	--	--	2	--	--	--	--	--	2
CO3	--	--	2	--	--	3	--	--	--	3	2	3	-
CO4	--	--	--	3	--	--	--	3	--	--	--	--	2
CO5	2	--	--	--	--	--	--	--	--	2	--	2	-

UNIT I : Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabled Technologies, IoT Levels and Deployment Templates

UNIT II: Domain Specific IoTs

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle

UNIT III: IoT AND M2M

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT IoT System Management: Need for IoT Systems Management, SNMP, NETCONF, YANG, YANG-NETCONF, NETOPEER.

UNIT IV: IoT Physical Devices & Endpoints

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces (Serial, SPI, and I2C), Programming Raspberry Pi with Python, Other IoT Devices

UNIT V: **IoT Physical Servers and Cloud Offerings**

Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework – Django, Designing a RESTful Web API.

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, —Internet of Things - A Hands-on Approachl, Universities Press, 2015, ISBN: 9788173719547.

2. Matt Richardson & Shawn Wallace, O'Reilly (SPD),lGetting Started with Raspberry Pil, 2014, ISBN: 978935023975.

REFERENCE BOOKS:

1. Pethuru Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", (CRC Press).

2. Adrian McEwen, —Designing the Internet of Thingsl, Wiley Publishers, 2013, ISBN: 978-1- 118-43062-0.

3. Daniel Kellmereit, —The Silent Intelligence: The Internet of Thingsl, 2013, ISBN: 0989973700.

4. Ovidiu Vermesan, Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment", River Publishers Series in Communication, June 2014.

E-RESOURCES:

https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf.

http://nptel.ac.in/courses/106105166

20A2105491-Python Programming Lab

Lecture – Tutorial- Practical:: 0-0-3 **Internal Marks**

Credits: 1.5 **External Marks**

Prerequisites:

Adequate exposure to Programming

A basic understanding on various computer concepts , C programming basic syntax

Course Objectives:

To learn the fundamentals of python programming

To get a solid understanding of python functions and data structures

To demonstrate the use of python lists and dictionaries

To implement methods and functions to improve readability of programs.

Students able to describe and apply object-oriented programming methodology.

Students able to build software for real needs and prior introduction to testing software

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Experience with an interpreted Language and to build software for real needs
CO2	Use basic Decision structures, Boolean logic, variable types, assignments and operators.
CO3	Describe and use of Python lists, dictionaries, tuples and sets.
CO4	Implement methods and functions to improve readability of programs
CO5	Describe and apply object-oriented programming methodology, top-down concepts in algorithm design.
CO6	Design, code ,test and debug python language programs

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	3	--	--	--	3	--	--	--	3	--	3	--	3
CO2	--	3	2	--	--	--	--	--	--	--	--	--	2
CO3	--	--	--	2	3	--	--	--	3	--	--	--	3
CO4	--	--	--	3	3	--	--	--	3	--	--	--	2

CO5	--	--	--	3	--	--	--	--	--	--	3	--	3
CO6	--	--	--	--	2	--	--	--	3	--	3	--	2

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purposefully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user

(Pythagorean Theorem)

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise - 3 Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10

c) Write a program using a for loop that loops over a sequence.

d) Write a program using a while loop that asks the user for a number, and prints a countdownfrom that number to zero

Exercise 4 - Control Flow - Continued

a) Find the sum of all the primes below two million

b) Each new term in the Fibonacci sequence is generated by adding the previous two terms. Bystarting with 1 and 2,

the first 10 terms will be:1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

c) By considering the terms in the Fibonacci sequence whose values do not exceed four million,find the sum of the

even-valued terms

Exercise - 5 - DS

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character

frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball_collide that takes two balls as parameters and computes if they are

colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions- Continued

a) Write a function nearly_equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

b) Write a program to perform addition of two square matrices

c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a)Write a program that defines a module "person" and import it

b)write a program that renames a module

Exercise - 13 OOP

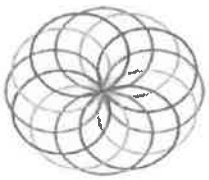
a) Class variables and instance variable and illustration of the self variable

i) Robot

ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk
2. Write a program to implement the following figures using turtle:



Exercise - 15 - Testing

a) Write a test-case to check the function even_numbers which return True on passing a list of all even numbers

b) Write a test-case to check the function reverse_string which returns the reversed string

Exercise - 16 - Advanced

Build any one classical data structure

TEXT BOOKS:

1. Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

REFERENCE BOOKS:

Think Python , Allen Downey , Green Tea Press

E-RESOURCES:

https://www.tutorialspoint.com/python/
https://docs.python.org/3/tutorial/
https://www.w3schools.com/python/
https://www.javatpoint.com/python-tutorial

- see his/her leave history since the time he/she joined the company/college
- apply for leave, specifying the from and to dates, reason for taking leave, address for communication while on leave and his/her superior's email id
- see his/her current leave applications and the leave applications that are submitted to him/her for approval or cancellation
- approve/reject the leave applications that are submitted to him/her
- withdraw his/her leave application (which has not been approved yet)
- Cancel his/her leave (which has been already approved). This will need to beapproved by his/her Superior
- get help about the leave system on how to use the different features of the system
- As soon as a leave application /cancellation request /withdrawal /approval /rejection /password-change is made by the person, an automatic email should be sent to the person and his superior giving details about the action
- The number of days of leave (as per the assumed leave policy) should be automatically credited to everybody and a notification regarding the same be sent to them automatically
- An automatic leave-approval facility for leave applications which are older than 2 weeks should be there. Notification about the automatic leave approval should be sent to the person as well as his superior

3. E-Bidding

Auctions are among the latest economic institutions in place. They have been used since antiquity to sell a wide variety of goods, and their basic form has remained unchanged. In this dissertation, we explore the efficiency of common auctions when values are interdependent- the value to a particular bidder may depend on information available only to others-and asymmetric. In this setting, it is well known that sealed-bid auctions do not achieve efficient allocations in general since they do not allow the information held by different bidders to be shared.

Typically, in an auction, say of the kind used to sell art, the auctioneer sets a relatively low initial price. This price is then increased until only one bidder is willing to buy the object, and the exact manner in which this is done varies. In my model a bidder who drops out at some price can "reenter" at a higher price.

With the invention of E-commerce technologies over the Internet the opportunity to bid from the comfort of one's own home has seen a change like never seen before. Within the span ofa few short years, what may have began as an experimental idea has grown to an immensely popular hobby, and in some cases, a means of livelihood, the Auction Patrol gathers tremendous response every day, all day. With the point and click of the mouse, one may bid on an item they may need or just want, and in moments they find that either they are the top bidder or someone else wants it more, and you're outbid! The excitement of an auction all from the comfort of home is a completely different experience.

Society cannot seem to escape the criminal element in the physical world, and so it is the same with Auction Patrols. This is one area where in a question can be raised as to how safe Auction Patrols.

Proposed system
To generate the quick reports
To make accuracy and efficient calculations
To provide proper information briefly
To provide data security
To provide huge maintenance of records Flexibility of
transactions can be completed in time

4. Electronic Cash counter

This project is mainly developed for the Account Division of a Banking sector to provide better interface of the entire banking transactions. This system is aimed to give a better out look to the user interfaces and to implement all the banking transactions like:

- Supply of Account Information

- New Account Creations
- Deposits
- Withdraws
- Cheque book issues
- Stop payments
- Transfer of accounts
- Report Generations.

Proposed System:

The development of the new system contains the following activities, which try to automatethe entire process keeping in view of the database integration approach.

- User friendliness is provided in the application with various controls.
- The system makes the overall project management much easier and flexible.
- Readily upload the latest updates, allows user to download the alerts by clicking theURL.
- There is no risk of data mismanagement at any level while the project development isunder process.
- It provides high level of security with different level of authentication

Other Sample Projects :

1. Passport automation System
2. Book Bank
3. Online Exam Registration
4. Stock Maintenance System
5. Online course reservation system
6. E-ticketing
7. Software Personnel Management System
8. Credit Card Processing
9. E-book management System.
10. Recruitment system

TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.

2. Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.
3. The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education

REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009
2. RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

E-RESOURCES:

1. http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf
2. http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf
3. http://sites.computer.org/ccse/SE2004Volume.pdf
4. http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF
5. http://www.dau.mil/pubs/pdf/SEFGuide 01-01.pdf
6. https://nptel.ac.in/courses/106101061/2
7. https://nptel.ac.in/courses/106101061/5

20A2105492-DATABASEMANAGEMENTSYSTEMS LAB

Lecture – Tutorial- Practical:: 0-0-3 **Internal Marks:**

Credits: 1.5 **External Marks**

Prerequisites:

C Progr: ming, Mathematics

Course Objectives:

- Design and implement a database schema for a given problem-domain
- Populate and query a database using SQLDML/DDL commands.
- Declare and enforce integrity constraints on a database
- ProgrammingPL/SQLincludingstoredprocedures,stored functions,cursors,pac kages.
- Understand realtime database design models and cancodethemodel
- understandandretrieveinformationfromcomplexdesigneddatabasesusingcorr :latednestedqueries

Course Outcomes:

Upon su cessful completion of the course, the student will be able to:

CO1	Queries for Creating, Dropping, and Altering Tables, Views, and Constraints
CO2	Queries to Retrieve and Change Data:Select, Insert,Delete,andUpdate
CO3	QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFun :tionsandConversion Functions.
CO4	Queries using GroupBy,OrderBy,andHavingClauses
CO5	Queries on Joins and CorrelatedSub-Queries
CO6	Queries on Controlling Data:Commit,Rollback,andSavepoint

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2
CO5	2	2	2	--	2	--	--	--	--	--	--	--	2
CO6	2	2	3	--	2	--	--	--	--	--	--	--	2

ListofExperiments :

SQL

1. QueriesforCreating,Dropping,andAlteringTables,Views,andConstraints
2. QueriestoRetrieveandChangeData:Select,Insert,Delete,andUpdate
3. QueriesusingoperatorsinSQL
4. QueriesusingBuilt-InFunctions:StringFunctions,NumericFunctions,DateFunctionsandConversion Functions
5. QueriesusingGroupBy,OrderBy,andHavingClauses
6. Queries on Controlling Data: Commit, Rollback, and Save point
7. Queries on Joins and Correlated Sub-Queries
8. Queries on Working with Index, Sequence, Synonym

PL/SQL

1. WriteaPL/SQLCodeusingBasicVariable,AnchoredDeclarations,andUsageofAssignmentOperation
2. WriteaPL/SQLCodeBindandSubstitutionVariables.PrintinginPL/SQL
3. WriteaPL/SQLblockusingSQLandControlStructuresinPL/SQL
4. WriteaPL/SQLCodeusingCursors,ExceptionsandCompositeDataTypes
5. WriteaPL/SQLCodeusingProcedures,Functions,TriggersandPackage

TEXT BOOKS:

FundamentalsofDatabaseSystems,ElmasriNavrate,6thedition, PearsonEducation

REFERENCE BOOKS:

1. "DatabaseSystemConcepts",.Korth,Slberchatz,Sudarshan,6thEdition,McGraw-Hill
2. PeterRobandCarlosCoronel,"DatabaseSystemsDesign,ImplementationandManagement",Thomson Learning,5thEdition.
3. IntroductiontoDatabaseSystems,CJDate,Pearson

DatabaseManagementSystems,RaghuramaKrishnan,JohannesGehrke,TATAMcGrawHill3rdEdition

20A2105493- INTERNET OF THINGS LAB

Lecture – Tutorial- Practical:: **Internal Marks:**

Credits: 1.5 **External Marks:**

Prerequisites: Python programming

Course Objectives:

The objective of this course, to give a comprehensive view of the —Internet of Things including Applications/ Potentials/ Challenges.To analyze enabling technologies to make it happen and to conduct Hands on activities .

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the application areas of IOT.
CO2	Understand building blocks of Internet of Things and characteristics.
CO3	Understand enabling technologies Embedded Devices and communication protocols for Hands on activities.
CO4	Write programs using Python for processing Internet of Things

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	3	--	--	--	--	2	--	3	--	--	2	--	3
CO2	--	--	2	2	--	--	2	--	2	2	--	2	--
CO3	--	3	--	--	3	--	--	--	--	--	--	--	--
CO4	--	--	--	--	--	--	--	3	--	--	2	--	3

CYCLE 1:

CYCLE - 1: Start Raspberry Pi and try various Linux commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.

CYCLE II:

1. Run some python programs on Pi like:
2. Read your name and print Hello message with name
3. Read two numbers and print their sum, difference, product and division.
4. Word and character count of a given string
5. Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
6. Print a name 'n' times, where name and n are read from standard input, using for and while loops.
7. Handle Divided by Zero Exception.

8. Print current time for 10 times with an interval of 10 seconds.
9. Read a file line by line and print the word count of each line.

CYCLE III:

1. Light an LED through Python program
2. Get input from two switches and switch on corresponding LEDs
3. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.

CYCLE IV:

1. Access an image through a Pi web cam.
2. Control a light source using web page.
3. Implement an intruder system that sends an alert to the given email.
4. Get the status of a bulb at a remote place (on the LAN) through web.

CYCLE V:

1. Get an alarm from a remote area (through LAN) if smoke is detected.
2. Display the room temperature on the display devices using sensors.
3. The student should have hands on experience in using various sensors like humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi.

REFERENCE BOOKS:

1. wwwusers.di.uniroma1.it/~spenza/files/labIoT2015/Lab-IoT-1.pdf.
2. www.mobileeducationkit.net/labmanuals/LAB-Manual-mbed.docx

Course Code- Web Application Development Using Full Stack – Frontend Development – Module - I

Lecture – Tutorial- Practical:: 0-0-4 | **Internal Marks**

Credits: 2 | **External Marks**

Prerequisites:

Course Objectives:

The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze a web page and identify its elements and attributes
CO2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
CO3	Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
CO4	Create web pages using HTML and Cascading Style Sheets.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2

List of Experiments :

HTML

1) Introduction to HTML
2) Browsers and HTML
3) Editor's Offline and Online
4) Tags, Attribute and Elements
5) Doctype Element
6) Comments
7) Headings, Paragraphs, and Formatting Text
8) Lists and Links
9) Images and Tables

8) CSS
1) Introduction CSS
2) Applying CSS to HTML
3) Selectors, Properties and Values
4) CSS Colors and Backgrounds
5) CSS Box Model
6) CSS Margins, Padding, and Borders
7) CSS Text and Font Properties
8) CSS General Topic

TEXT BOOKS:

WebTechnologies,UttamKRoy,OxfordJavaServerPages,HansBergstan,Oreilly

REFERENCE BOOKS:

- Web Technologies, HTML<JavaScript,PHP,Java,JSP,XMLandAJAX,Blackbook,DreamTech.
- An Introduction to Web Design, Programming, PaulSWang, SandaSKatila,Cengage
- An introduction toWeb Design and Programming,WangThomson

20A2105901: APTITUDE AND REASONING

COURSE DESCRIPTION AND OBJECTIVE:

1. Students will be introduced to various Arithmetic and Reasoning Problems.
2. The students will have acquaintance with various topics like Time, Speed and Distance, Percentages, Data Interpretation etc...
3. Aptitude is designed to assess the logical thinking and how well they are able to think out of the box. These ability tests (All the companies do prefer this test) are strictly timed to assess the speed and accuracy of the students in solving the problems.

COURSE OUTCOMES:

Upon successful completion of this course, students will be able to

1. Solve the Arithmetic and Reasoning Problems as fast as possible and as simple as possible.
2. Exhibits good analytical skills and aptitude skills.
3. Perform well in all competitive exams like RRB, SSC, GROUPS, and BANKING etc...
4. Clear the aptitude section of exams for higher education like CAT, GMAT, and GRE etc...

UNIT – I

1. PERCENTAGES
2. SIMPLE INTEREST & COMPOUND INTEREST

UNIT – II

1. TIME AND WORK
2. PIPES AND CISTERN

UNIT- III

1. DIVISION OF WAGES
2. MAN DAYS & CHAIN RULE

UNIT- IV

1. CODING AND DECODING
2. ALPHABET & NUMBER SERIES

UNIT – V

1. ANALOGY
2. ODD ONE OUT

TEXT BOOKS:

1) **APTIPEDIA, WILEY**
2) **Quantative Aptitude, RS AGARWAL, S.Chand Publishers**

REFERENCE BOOKS:

1). HOW TO PREPARE FOR Quantative Aptitude, ARUN SHARMA, Mc GRAW HILL

20A2200201-PROBABILITY AND STATISTICS

Lecture – Tutorial:	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:--- NIL

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Classify the concepts of data science and its importance
CO2	Interpret the association of characteristics and through the correlation and Regression tools
CO3	Make us of the concepts of probability and their applications
CO4	Apply discrete and Continuous probability distributions
CO5	Design the components of a classical hypothesis test
CO6	Infer the statistical inferential methods based on small and large sampling tests

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	--	--	--	--	--	--	--	--
CO2	3	3	2	2	--	--	--	--	--	--	--	--
CO3	3	3	2	2	--	--	--	--	--	--	--	--
CO4	3	3	2	2	--	--	--	--	--	--	-	--
CO5	3	3	2	2	--	--	--	--	--	--	-	--
CO6	3	3	2	2	--	--	--	--	--	--	--	--

UNIT I

Descriptive Statistics and Methods for Data Science : Data Science- Introduction to Statistics- Population Vs sample Collection of Data – Primary and Secondary Data - Types of Varibales : Dependent and Independent , Catagorical and Continuous Variables – Data Visualization - Measures of Central Tendency - Measures of Variability (spread and variance) – Skewness and Kurtosis

UNIT II

Correlation and Curve Fitting : Correlation –Correlation Coefficient – Rank Correlation – Regression Coefficients an properties – Regression lines – Method of Least Squares – Straight line – parabola – Exponential –power curves

UNIT III

Probability and distributions: Probability and conditional probability-Baye's theorem-Random variables- Discrete and continuous Random variables –Distribution Function- Mathematical Expectation and Variance – Binomial ,Poisson and Uniform and Normal Distributions

UNIT IV

Introduction – Population and Samples – Sampling distribution of Means and Variance (definition only) – Central li nit theorem (without proof) – Representation of the normal theory distributions –– Point and Interval estimation - Maximum error of estimate. Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II erro s - Level of significance

UNIT V

One tail and two-tail tests-Tests Concerning One Mean and Two Means (Large Samples) – Tests on Proportions. Introduction to t, χ^2 and F – Tests.

TEXT BOOKS:

1) Miller and Freund's, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2) S. C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

REFERENCE BOOKS:

1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
2) Jay l. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.

E-RESOURCES:

1.nptel

20A2205401- Web Technologies

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Java Programming

2. DataBaseManagementSystems

Course Objectives:

To understand the concepts of Hyper Text Markup Language and Cascading Style Sheets

To learn JavaScript for creating dynamic websites

To learn the operations perform on data among web applications usingXML

To learn Server-SideProgramming using Servlets and JavaServerPages.

To learn the creationof pure DynamicWebApplication using JDBC

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Student able to Implement and design webbased applications using features of HTML
CO2	Implement webbased applications using features of XML
CO3	Student will Apply the concepts of server side technologies for dynamic web applications
CO4	Ability to design the webbased applications using effective database access with rich client interaction
CO5	Abilityto Develop reusable component for Graphical User Interface applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	-	-	3	-	-	-	-	-	-	-	-	2	3
CO2	-	-	3	-	-	-	-	-	-	-	-	2	3
CO3	3	-	2	-	-	-	-	-	-	-	-	2	3
CO	-	3	3	2	-	-	-	-	-	-	-	2	3

20A2205402- SOFTWARE ENGINEEEING

Lecture – Tutorial-Practical::	3	0	0	**Internal Marks:**	30
Credits:	3			**External Marks:**	70

Prerequisites:

Programming and problem solving, General Aptitude

Course Objectives:

1. To study pioneer of Software Development Life Cycle, Development models and Agile Software development.
2. To study the concepts related to analysis, design concepts of software development
3. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
4. To discuss various software testing strategies viz., unit test; integration, regression, and system testing and validation testing
5. To learn the process of improve the quality of software work products.
6. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concepts of Software engineering and applications
CO2	Compare different software engineering process models
CO3	Analyze the principles of requirement Engineering
CO4	Create design models for software Engineering projects
CO5	Apply different testing techniques

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3
CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--
CO4	--	2	--	--	--	--	--	--	--	3	--	--	2	--
CO5	--	--	2	--	--	--	--	--	--	2	--	--	--	3

UNIT I :

Software and Software Engineering: The Nature of Software, Defining Software, Software Application Domains, Legacy Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software

Engineering Practice, The Essence of Practice, General Principles, Software Myths.
The Software Process: Software Engineering, Software Process, Generic process model, Prescriptive process model, specialized, unified process, Agile development, Agile Process, Extreme Programming, Other agile Process models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

UNIT II:

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP) Other Agile Process Models, A Tool Set for the Agile Process.
Principles that guide practice, Software Engineering Knowledge, Principles That Guide Process, Principles That Guide Practice, Principles That Guide Each Framework Activity, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles

Understanding Requirements: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III:

Requirements Modeling: Scenarios, Information and Analysis classes: Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.
Requirements Modeling: Flow, Behavior, Patterns, And Web apps: Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirement modeling for WebApps.

UNIT IV:

Design Concepts: Design within the Context of Software Engineering, the Design Process, Design Concepts, the Design Model.
Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing Alternative Architectural Designs.
Modeling Component-Level Design: What Is a Component? Designing Class-Based Components, Conducting Component Level Design, and Component level design for Web Apps.
Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps.

UNIT V:

Software Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Validation testing, System testing, the art of debugging.
Testing Conventional Applications: Software Testing Fundamentals, Internal and External Views of Testing, White Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing, Model-Based Testing, Testing for Specialized Environments, Architectures, and Applications, Patterns for Software Testing.

TEXT BOOKS:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.

2. Ian Somerville, "Software Engineering". 9th ed, Pearson Education. 2011.

REFERENCE BOOKS:

1. Carlo Ghezzi, Mehdi Jazayeri and Dino Mandrioli, "Fundamentals of Software Engineering".2 ed, PHI. 2009
2. RajibMall, Fundamentals of Software Engineering. 3 ed, PHI. 2009.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
4. Hans Van Vliet, "Software Engineering: Principles and Practices"–, 2008.

E-RESOURCES:

1. http://www.dcnicn.com/BusinessNews/WVU-MIS13Apr00/Software-Engineering.pdf
2. http://www.comp.lancs.ac.uk/computing/resources/IanS/SE7/Presentations/PDF/ch1.pdf
3. http://sites.computer.org/ccse/SE2004Volume.pdf
4. http://homepages.cs.ncl.ac.uk/brian.randell/NATO/nato1968.PDF
5. http://www.dau.mil/pubs/pdf/SEFGuide 01-01.pdf
6. https://nptel.ac.in/courses/106101061/2
7. https://nptel.ac.in/courses/106101061/5

4													
CO5	-	3	-	3	2	-	-	-	-	-	-	3	3

UNIT I :

Introduction to Javascript, objects in JavaScript, Dynamic HTML with JavaScript

UNIT II:

Working with XML: Document Type Definition, XMLschemas, Documentobjectmodel, XSLT,DOM and SAX.

UNIT III:

Web Servers and Servlets: Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, and Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

UNIT IV:

Database Access: Database Programming using JDBC, studying javax.sql.*package, accessing a database from a JSP page, Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSPProcessing.JSP application design with MVC.

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing–Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests.

UNIT V:

PHP Programming: Introducing PHP: Creating PHP script, Running PHP script. **Working with variables and constants:** Using variables, Using constants, Data types,Operators.**Controlling program flow:** Conditional statements,Controlstatements,Arrays,functions.Working with forms and Databases such as MySQL.

TEXT BOOKS:

- TheComplete Reference,Java2, 3ed, PatrikNaughton, HerbertSchildt, TMH
- ProgrammingtheWorldWideWeb,RobetWSebesta,7ed,Pearson.
- WebTechnologies,UttamKRoy,OxfordJavaServerPages,HansBergstan,Oreilly

REFERENCE BOOKS:

- Web Technologies, HTML<JavaScript,PHP,Java,JSP,XMLandAJAX,Blackbook,DreamTech.
- An Introduction to Web Design, Programming, PaulSWang, SandaSKatila,Cengage
- An introduction toWeb Design and Programming,WangThomson
- Web application technologies concepts,Knuckles,JohnWiley.
- Programming worldwideweb,Sebesta,Pearson
- BeginningWebProgramming,JonDuckett,Wrox,WileyJavaserverpages,Pek owsky,Pearson

E-RESOURCES:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/perl/
3. https://www.railstutorial.org/book
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

20A2205403 OPERATING SYSTEMS

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Basics of Computer Organization.

Course Objectives:-Upon completion of this course, the student will be able to acquire the basic operating system concepts such as processes & threads.Explain the Details of some units such as memory management, I/O, and File systems.

CourseOutcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the important computer system resources and the structure and functioning of operating system.
CO2	Understand process management policies and scheduling of processes by CPU.
CO3	Evaluate the requirement for process synchronization and coordination handled by operating system. Describe and analyze the memory management and its allocation policies.
CO4	Understand demand paging, thrashing and principles of deadlocks.
CO5	Understand File system Interface, File System implementation, Mass-storage structure and Disk scheduling algorithms.

ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1–Low,2-Medium,3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-

UNITI :

Computer System and Operating System Overview: Overview of computer operating systems ,operating systems functions, operating systems structures and systems calls, operating systems generation.

UNITII:

Process Management – Process concept- process scheduling, operations, Inter process communication. MultiThread programming models. Process scheduling criteria and algorithms and their evaluation.

UNITIII:

Concurrency:Processsynchronization, thecritical-sectionproblem, Peterson'sSolution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples.
MemoryManagement:Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.

UNITIV:

Virtual Memory Management: virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing. **Principles of deadlock** – system model, deadlock characterization, deadlock prevention,

detection and avoidance, recovery from deadlock.

UNITV:

File System Interface-The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.
File System implementation-File system structure, file system implementation, directory implementation, allocation methods, free-space management
Mass-storagestructure:overview of Mass storage structure, Diskstructure, disk attachment, disk scheduling, swap-space management.

TEXTBOOKS:

1. OperatingSystemConcepts-AbrahamSilberchatz,PeterB.Galvin,GregGagne7thEdition,JohnWiley.
2. OperatingSystems–InternalandDesignPrinciples,WilliamStallings,SixthEdition–2005,PearsonEducation.

REFERENCEBOOKS:

1. Operatingsystems-AConceptbasedApproach-D.M.Dhamdhere,2ndEdition,TMH.
2. OperatingSystemADesignApproach-Crowley,TMH.
3. ModernOperatingSystems,AndrewSTanenbaum3rdeditionPHI.

E-RESOURCES:

https://nptel.ac.in/courses/106105214/
https://www.udacity.com/course/introduction-to-operating-system-ud923
https://www.youtube.com/watch?v=qf668RboXLs
https://www.youtube.com/watch?v=VoaNyf9i04Q&list=PLV8vIYTIdSnaHTJrBXJSyNTOWEtA33hvn

Formal Languages and Automata Theory

Lecture – Practical::	**Tutorial-** 3-0-0	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

Course Objectives:-

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing
3. To explain the hierarchy of problems arising in the computer sciences.
4. To familiarize Regular grammars, context frees grammar.

CourseOutcomes:

Upon successful completion of the course, the student will be able to:

CO1	Able to use basic concepts of formal languages of finite automata techniques
CO2	Student able to design Finite Automata's for different Regular Expressions and Languages
CO3	Construct context free grammar for various languages
CO4	Solve various problems of applying normal form techniques, push down automata and Turing Machines
CO5	Participate in GATE, PGECET and other competitive examinations

ContributionofCourseOutcomestowardsachievementofProgramOutcomes(1-Low,2-Medium,3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-

UNIT I : FINITE AUTOMATA (FA)

Introduction to Finite Automata, Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Equivalence of NFA and DFA. Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Minimization of Deterministic Finite Automata, Finite automata with output (Moore and Mealy machines) and Inter conversion. Text search using automata.

UNIT II: REGULAR EXPRESSIONS (RE) & REGULAR GRAMMARS

Introduction, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, Converting Regular Expressions to Automata, applications of Regular Expressions.
Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. Proving languages to be non-regular -Pumping lemma, Closure properties of regular languages. Applications of RE – RE in Unix

UNIT III: CONTEXTS FREE GRAMMER (CFG) & Push Down Automata(PDA)

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL.
Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required).
Introduction to DCFL and DPDA.

UNIT IV: Turing Machines(TM)

Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines (proofs not required). , linear bounded automata and context sensitive language.

UNIT V: Computability Theory:

Chomsky hierarchy of languages, decidability of, problems, Universal Turing Machine, undecidability of posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXTBOOKS:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.

2. Introduction to Theory of Computation –Sipser 2nd edition Thomson.

REFERENCEBOOKS:

- Introduction to Formal Languages , Automata Theory and Computation – Kamala Krithivasan, Rama R
- Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
- Theory of Computation : A Problem – Solving Approach- Kavi Mahesh, Wiley India Pvt. Ltd.
- "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
- Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI.
- Introduction to languages and the Theory of Computation, John C Martin, TMH..

E-RESOURCES:

1. Foundations of Computation-CAROL CRITCHLOW, DAVID ECK
2. Introduction to Theory of Computation- Anil Maheshwari,Michielsmid-carleton University-2012

20A2205491- WEB TECHNOLOGIES LAB

Lecture – Tutorial-Practical::		**Internal Marks:**	
Credits:	1.5		**External Marks**

Prerequisites:

1. **JavaProgramming**
2. **DataBaseManagementSystems**

20A2205492- SOFTWARE ENGINEEEING LAB

Lecture – Tutorial-Practical::	0-0-3	**Internal Marks:**	1 5
Credits:	1.5	**External Marks:**	3 5

Prerequisites:

Programming and problem solving, General Aptitude

Course Objectives:

- To understand the software engineering methodologies involved in the phases forproject development.
- To gain knowledge about open source tools used for implementing softwareengineering methods.
- To exercise developing product-startups implementing software engineering methods.
- To use Open source Tools, viz., StarUML / UMLGraph / Topcased

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Ability to translate end-user requirements into system and software requirements
CO2	Analyze the principles of requirement Engineering
CO3	Ability to generate a high-level design of the system from the software requirements
CO4	Create design models for software Engineering projects
CO5	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	--	--	--	--	--	--	--	--	--	--	--	2	--
CO2	--	--	2	--	--	--	--	--	3	--	2	--	--	3
CO3	--	2	3	--	--	--	--	2	--	3	2	--	--	--
CO4	--	2	--	--	--	--	--	--	--	3	--	--	3	--
CO5	--	--	3	--	--	--	--	--	--	2	--	--	--	3

List of Experiments

(For at least 4 problems)

Prepare the following documents and develop the software project startup, prototype model, using software engineering methodology for at least two real time scenarios or for the sample experiments.

1. Problem Analysis and Project Planning -Thorough study of the problem – IdentifyProject scope, Objectives and Infrastructure.
2. Software Requirement Analysis – Describe the individual Phases/modules of theproject and Identify deliverables: Identify functional and non-functional requirements.
3. Data Modeling – Use work products – data dictionary.
4. Software Designing - Develop use case diagrams and activity diagrams, build and testclass diagrams, sequence diagrams and add interface to class diagrams.
5. Prototype model – Develop the prototype of the product.

Sample Projects:

1. Course management system (CMS)

A course management system (CMS) is a collection of software tools providing an online environment for course interactions. A CMS typically includes a variety of online tools and environments, such as:

- An area for faculty posting of class materials such as course syllabus and handouts
- An area for student posting of papers and other assignments
- A grade book where faculty can record grades and each student can view his or hergrades
- An integrated email tool allowing participants to send announcement email messagesto the entire class or to a subset of the entire class
- A chat tool allowing synchronous communication among class participants
- A threaded discussion board allowing asynchronous communication among participants

In addition, a CMS is typically integrated with other databases in the university so that students enrolled in a particular course are automatically registered in the CMS as participants in that course.

The Course Management System (CMS) is a web application for department personnel, Academic Senate, and Registrar staff to view, enter, and manage course information formerly submitted via paper.

Departments can use CMS to create new course proposals, submit changes for existing courses, and track the progress of proposals as they move through the stages of online approval.

2. Easy Leave

This project is aimed at developing a web based Leave Management Tool, which is of importance to either an organization or a college.

The **Easy Leave** is an Intranet based application that can be accessed throughout the organization or a specified group/Dept. This system can be used to automate the workflow of leave applications and their approvals. The periodic crediting of leave is also automated. There are features like notifications, cancellation of leave, automatic approval of leave, report generators etc in this Tool.

Functional components of the project:

There are registered people in the system. Some are approvers. An approver can also be a requestor. In an organization, the hierarchy could be Engineers/Managers/Business Managers/Managing Director etc. In a college, it could be Lecturer/Professor/Head of the Department/Dean/Principal etc.

Following is a list of functionalities of the system: A person should be able to

- login to the system through the first page of the application
- change the password after logging into the system
- see his/her eligibility details (like how many days of leave he/she is eligible for etc)
- query the leave balance

Course Objectives:

1	HyperTextMarkupLanguage(HTML)andCascadingStyleSheets(CSS)forlayingout(formatting)pages that contain text, images andgraphics
2	ExtensibleMarkupLanguages(XMLisusedtostoreandtransportdataamongwebpages),amechanismfordefining newtagsets and interchangingdataamongwebapplications
3	Client-sideProgrammingusingJavaScriptforvalidatingthe data
4	Server-SideProgrammingusingservletsaretogeneratestaticcontentandJavaServerPagesareusedtogenerate dynamiccontent
5	CreatingapureDynamicWebApplicationwhichretrievesthedatafromDatabaseaccordingtotheclient request usingJDBC
6	CreatingapureDynamicWebApplicationwhichretrievesthedatafromDatabaseaccordingtotheclient request usingPHP

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Createawebsitestaticallyordynamically
CO2	Getknowledgeon displayingand decoratingthecontentsin awebpage.
CO3	Learntheconceptsofstoreandtransportthedataamongwebpages
CO4	Createobjectswithwhichtheclientcancommunicatewithserver.
CO5	Generatestaticordynamiccontentaccordingtotheclient'srequest
CO6	ProvideUser Authentication byusingcookiesand back end operations usingJDBC and PHP

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1
CO1	-	-	3	-	-	-	-	-	-	-	-	2	3
CO2	-	-	3	-	-	-	-	-	-	-	-	2	3
CO3	3	-	2	-	-	-	-	-	-	-	-	2	3
CO4	-	3	3	2	-	-	-	-	-	-	-	2	3
CO5	-	3	-	3	2	-	-	-	-	-	-	3	3
Total	3	6	11	5	2	-	-	-	-	-	-	11	3

Week-1:
Designthefollowingstaticweb pagesrequired foranonlinebook storeweb site.

Week-1:
Designthefollowingstaticweb pagesrequired foranonlinebook storeweb site.
1)**HOMEPAGE:**
Thestatichomepagemust containthree**frames.**
Topframe: Logoandthecollegenameandlinkstohomepage,Loginpage,Registrationpage,

Catalogue pageandCartpage (thedescriptionof these pageswillbegivenbelow).

Leftframe: Atleastfourlinksfornavigation,whichwilldisplaythecatalogueofrespectivelinks. Fore.g.:Whenyouclickthelink"**CSE**"thecatalogueforCSEBooksshould be displayedintheRightframe.

Rightframe: The*pagestothelinksintheleftframemustbeloadedhere*.Initiallythispagecontains descriptionofthewebsite.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

2) LOGINPAGE:

Thispagelooks likebelow:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login : Password: Submit Reset			

3) CATOLOGUEPAGE:

Thecataloguepageshouldcontain thedetails ofall thebooksavailable inthe websiteina table.Thedetails should contain the following:

1. SnapshotofCoverPage.
2. AuthorName.
3. Publisher.
4. Price.
5. Addto cartbutton.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL		Book : XML Bible Author : Winston Publication : Wiely	$ 40.5	Add to cart
		Book : AI Author : S.Russel Publication . Princeton hall	$ 63	Add to cart
		Book : Java 2 Author : Watson Publication : BPB publications	$ 35.5	Add to cart
		Book : HTML in 24 hours Author : Sam Peter Publication : Sam Publication	$ 50	Add to cart

Note:Week2 containstheremainingpages andtheir description.

Week-2:

4) **CARTPAGE:**Thecart pagecontainsthedetailsabout thebookswhich areaddedto thecart.Thecartpageshould look likethis:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	**Book name** Java 2 XML bible	**Price** $35.5 $40.5	**Quantity** 2 1 **Total amount** -	**Amount** $70 $40.5 $130.5

5) REGISTRATIONPAGE:

Createa"*registrationform* "withthefollowingfields

1) Name(Textfield)
2) Password(passwordfield)
3) E-mailid (textfield)
4) Phonenumber(text field)
5) Sex (radiobutton)
6) Dateofbirth(3selectboxes)
7) Languagesknown(checkboxes –English,Telugu,Hindi,Tamil)
8) Address(textarea)

WEEK3:

VALIDATION:

Write*JavaScript* to validatethe followingfields oftheaboveregistrationpage.

1. Name(Name shouldcontains alphabetsand thelength shouldnot belessthan 6characters).
2. Password(Passwordshouldnot belessthan6 characterslength).
3. E-mail id (should not contain any invalid and must follow the standard patternname@domain.com)
4. Phone number (Phone number should contain 10 digits only).Note:Youcan alsovalidatethelogin pagewiththeseparameters.UsePHPto connectwiththedatabaseto storetheabovedetails.

Week-4:

Designawebpageusing **CSS (CascadingStyleSheets)**whichincludesthe following:

1) Usedifferent font, styles:

Inthestyledefinitionyoudefinehow eachselectorshouldwork(font,coloretc.).Then,inthebodyofyour pages,yourefertotheseselectorstoactivatethe styles.

Forexample:

```
<HTML>
<HEAD>
<style type="text/css">
B.headline {color:red; font-size:22px; font-family:arial; text-decoration:underline}
</style>

</HEAD>
```

```
<BODY>
<b>This is normal bold</b><br>
Selector {cursor:value}

For example:

<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>

<b class="headline">This is headline style bold</b>
</BODY>

</HTML>
```

2) Setabackgroundimage forboththepageandsingleelementson thepage.Youcan definethe background imageforthepagelikethis:

```
BODY {background-image:url(myimage.gif);}
```

3) Control the repetition of the image with the background-repeat property.Asbackground-repeat: repeat
Tilesthe imageuntil theentirepageisfilled, justlikeanordinarybackground imageinplainHTML.

4) Define styles for links
asA:link
A:visitedA
:activeA:h
over

Example:

```
<styletype="text/css">
A:link {text-decoration:
none}A:visited {text-decoration:
none}A:active{text-decoration:none}
A:hover{text-decoration:underline;color:red;}
</style>
```

5) Workwithlayers:
Forexample:
LAYER1ONTOP:

```
<divstyle="position:relative;font-size:50px;z-index:2;">LAYER1</div>
<div style="position:relative; top:-50; left:5; color:red; font-size:80px;
zindex:1">LAYER2</div>
```

LAYER2ONTOP:

```
<divstyle="position:relative;font-size:50px;z-index:3;">LAYER1</div>
<div style="position:relative; top:-50; left:5; color:red; font-size:80px;
zindex:4">LAYER2</div>
```

6) Add a customized
cursor:Selector{cursor:va
lue}

Forexample:

```
<html>
<head>
<style type="text/css">
.xlink {cursor:crosshair}
.hlink{cursor:help}
</style>
</head>

<body>
<b>
<a href="mypage.htm" class="xlink">CROSS LINK</a>
<br>
<a href="mypage.htm" class="hlink">HELP LINK</a>
</b>
</body>
</html>
```

Week-5:

WriteanXMLfile which willdisplaytheBookinformation whichincludesthefollowing:

1) Title ofthebook
2) AuthorName
3) ISBNnumber
4) Publishername
5) Edition
6) Price

WriteaDocumentTypeDefinition(DTD)tovalidate theaboveXMLfile.DisplaytheXMLfileasfollows.
Thecontentsshouldbedisplayedinatable.Theheaderofthetableshouldbeincolor GREY.And the Authornamescolumnshouldbedisplayedinonecolorandshouldbecapitalizedandinbold.Useyour own colors forremaining columns.
UseXMLschemas XSLand CSS forthe abovepurpose.
Note:Giveatleastfor4 books. Itshouldbevalidsyntactically.Hint:You can usesome xml editors like XML-spy

Week-6:

1) InstallTOMCATwebserverandAPACHE.
Whileinstallationassignportnumber4040toTOMCATand8080toAPACHE.Makesurethattheseports areavailablei.e., no other process is usingthis port.

2) Accesstheabovedevelopedstaticwebpagesforbookswebsite,usingtheseserversbyputtingthe web pages developed in week-1 andweek-2 in thedocument root.
Access the pages by using the urls :http://localhost:4040/rama/books.html (for tomcat)http://localhost:8080/books.html (forApache)

Week-7:

UserAuthentication:

Assumefourusersuser1,user2,user3anduser4havingthepasswordspwd1,pwd2,pwd3andpwd4respectively.
Writeaservelet fordoingthefollowing.

1. CreateaCookieandadd thesefouruser id'sand passwordsto this Cookie.
2. Readtheuseridandpasswordsenteredintheloginform(week1)andauthenticatewiththevalues(useridand passwords) available in thecookies.

If heisavaliduser(i.e.,user-name andpassword match)youshould welcomehimbyname(user-name)elseyou shoulddisplay"Youarenot anauthenticated user".
Useinit-parameterstodothis.Storetheuser-namesandpasswordsinthewebinf.xmlandaccessthemin theservlet byusingthegetInitParameters() method.

Week-8:

Installadatabase(Mysql orOracle).
Createatablewhichshouldcontainatleastthefollowingfields:name,password,email-id,phonenumber(theseshould hold the data from theregistration form).
Practice'JDBC'connectivity.
Writeajavaprogram/servlet/JSP/PHPtoconnecttothatdatabaseandextractdatafromthetablesanddisplaythe m. Experiment with various SQLqueries.
Insertthedetailsoftheuserswhoregisterwiththewebsite,wheneveranewuserclicksthesubmitbutton inthe

registration page(week2).

Week-9:

WriteaJSP whichdoes the followingjob:
Insert the details of the 3 or 4 users who register with the web site (week9) by using registrationform. Authenticate the user when he submits the login form using the user name and passwordfromthedatabase(similar to week8 instead of cookies).

Week-10:

Create tables in the database which contain the details of items (books in our case like Bookname , Price, Quantity, Amount)) of each category. Modify your catalogue page (week 2)in sucha way that you should connect to the database and extract data from the tables and display theminthecatalogue pageusingJDBC.

TEXT BOOKS:

- TheComplete Reference,Java2, 3ed, PatrikNaughton, HerbertSchildt, TMH
- ProgrammingtheWorldWideWeb,RobetWSebesta,7ed,Pearson.
- WebTechnologies,UttamKRoy,OxfordJavaServerPages,HansBergstan,Oreilly

REFERENCE BOOKS:

- WebTechnologies,HTML<JavaScript,PHP,Java,JSP,XMLandAJAX,Blackboo k,DreamTech.
- AnIntroductiontoWebDesign,Programming,PaulSWang,SandaSKatila,Cengage
- AnintroductiontoWebDesignandProgramming,WangThomson
- Webapplicationtechnologiesconcepts,Knuckles,JohnWiley.
- Programmingworldwideweb,Sebesta,Pearson
- BeginningWebProgramming,JonDuckett,Wrox,WileyJavaserverpages,Pekowsk y,Pearson

E-RESOURCES:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/perl/
3. https://www.railstutorial.org/book
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

20A2205493: Operating Systems &Unix programming Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C-Programming

Operating Systems & Unix programming Lab

Course Objectives:

To understand the design aspects of operating system.
To study the process management concepts & Techniques.
To familiarize students with the Linux environment.
To learn the fundamentals of shell scripting/programming.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Students able to implement CPU scheduling algorithms ,File Organization techniques and paging techniques
CO2	Students able to write shell scripts in Linux platform.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	2	3	3	-	-	-	-	-	-
CO2	3	3	3	2	3	3	-	-	-	-	-	-

EXPERIMENTS :

PART-A

1. Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate MVT and MFT
3. Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Prevention.
6. Simulate all page replacement algorithms a) FIFO b) LRU c) LFU Etc. ...
7. Simulate Paging Technique of memory management.
8. Simulate all file allocation strategies a) Sequential b) Indexed c) Linked

PART-B

1. Write a shell script to generate a multiplication table.
2. Write a shell script that copies multiple files to a directory.
3. Write a shell script which counts the number of lines and words present in a given file.
4. Write a shell script which displays the list of all files in the given directory.
5. Write a shell script(small calculator) that adds, subtracts, multiplies and divides the given two integers.
6. Write a shell script to reverse the rows and columns of a matrix.
7. Write a C program that counts the number of blanks in a text file.
8. C program Displaying real time of day for every 60 seconds
9. Write a C program that illustrates the creation of child process using fork system call.
10. Write a C program that illustrates file locking using semaphores.
11. Write a C program that implements a producer-consumer system with two processes.(using semaphores)
12. Write a C program that illustrates the following.

a)Creating a message queue.
b) Writing to a message queue.
c) Reading from a message queue.

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition–2005, Pearson education
3.Advanced Programming in the UNIX Environment, 3rd EditionW. Richard Stevens, Stephen A. Rago
4.A Practical Guide to Linux Commands, Editors, and Shell ProgrammingMark G. Sobell, Matthew Helmke

REFERENCE BOOKS:

1. Operating systems- A Concept based Approach-D.M.Dhamdhere, 2nd Edition, TMH.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 3rd edition PHI.
4. The Linux Programming Interface.A Linux and UNIX System Programming Handbook Michael Kerrisk.
5. Shell Programming in Unix, Linux and OS XThe Fourth Edition of Unix Shell Programming Stephen G. Kochan, Patrick Wood
6. Shell ScriptingHow to Automate Command Line Tasks Using Bash Scripting and Shell ProgrammingJaosn Cannon

E-RESOURCES:

https://www.tutorialspoint.com/unix/index.htm

https://www.guru99.com/unix-linux-tutorial.html
https://www.javatpoint.com/linux-tutorial
https://nptel.ac.in/courses/106105214/
https://www.udacity.com/course/introduction-to-operating-systems--ud923
https://www.youtube.com/watch?v=qf668RboXLs

Course Code- APPLICATIONS OF PYTHON- NumPy,Pandas

Lecture – Tutorial- Practical:: 0-0-4	**Internal Marks:**
Credits: 2	**External Marks:**

Prerequisites:

Course Objectives:

The objective of this lab is to acquire programming skills in Python package NumPy and the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
CO2	Understand how to apply some linear algebra operations to n-dimensional arrays
CO3	Use NumPy perform common data wrangling and computational tasks in Python
CO4	Use Pandas to create and manipulate data structures like Series and DataFrames, work with arrays, queries, and dataframes
CO5	Query DataFrame structures for cleaning and processing and manipulating files
CO6	Understand best practices for creating basic charts

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PS	P

	1	2	3	4	5	6	7	8	9	10	11	12	01	0
CO1	3	2	--	--	--	--	--	--	--	--	--	--	2	
CO2	2	3	3	--	2	--	--	--	--	--	--	--	--	
CO3	2	2	2	--	2	--	--	--	--	--	--	--	2	
CO4	2	2	3	--	3	--	--	--	--	--	--	2	2	
CO5	2	2	3	--	3	--	--	--	--	--	--	2	2	
CO6	2	3	3	--	2	--	--	--	--	--	--	--	--	

List of Experiments :

Exercise –I: Numpy

1) NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2) NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3) Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5) Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6) NumPy data types
7) NumPy ndarray
8) NumPy String Operations
9) NumPy Financial functions
10) NumPy Functional Programming

Exercise –II: Pandas

A) Pandas DataSeries:

1) Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
2) Write a Pandas program to convert a Panda module Series to Python list and it's type.
3) Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
4) Write a Pandas program to convert a NumPy array to a Pandas series. Sample Series: NumPy array: [10 20 30 40 50] Converted Pandas series: 0 10 1 20 2 30 3 40 4 50 dtype: int64

B) Pandas DataFrames:

Consider Sample Python dictionary data and list labels: exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas'], 'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19], 'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1], 'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']} labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']

1) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
2) Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
3) Write a Pandas program to insert a new column in existing DataFrame.
4) Write a Pandas program to get list from DataFrame column headers.

C) Pandas Index:

1) Write a Pandas program to display the default index and set a column as an Index in a given dataframe.

2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

D) Pandas String and Regular Expressions:

1) Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.

2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.

3) Write a Pandas program to count of occurrence of a specified substring in a DataFrame column. 4) Write a Pandas program to swap the cases of a specified character column in a given DataFrame.

E) Pandas Joining and merging DataFrame:

1) Write a Pandas program to join the two given dataframes along rows and assign all data.

2) Write a Pandas program to append a list of dictioneries or series to a existing DataFrame and display the combined data.

3) Write a Pandas program to join the two dataframes with matching records from both sides where available.

F) Pandas Time Series:

1) Write a Pandas program to create

a) Datetime object for Jan 15 2012.

b) Specific date and time of 9:20 pm.

c) Local date and time.

d) A date without time.

e) Current date.

f) Time from a datetime.

g) Current local time.

2) Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.

3) Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index

G) Pandas Styling:

1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.

2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.

H) Excel:

1) Write a Pandas program to import excel data into a Pandas dataframe.

2) Write a Pandas program to find the sum, mean, max, min value of a column of file.

I) Plotting:

1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.

2) Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.

J) Pandas SQL Query:

1) Write a Pandas program to display all the records of a student file.

2) Write a Pandas program to select distinct department id from employees file.

TEXT BOOKS:

1. Python Programming: A Modern Approach , Vamsi Kurama,Pearson

2. Learning Python , Mark Lutz ,Orielly

REFERENCE BOOKS:

Think Python , Allen Downey , Green Tea Press

20A2200802: Professional Ethics & Human Values

Lecture – Tutorial- Practical:	0-2-0	**Internal Marks:**	30
Credits:	0	**External Marks:**	70*
Prerequisites:			

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of others
- To create awareness on assessment of safety and risk

Course Outcomes

Students will be able to:
Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
Identify the multiple ethical interests at stake in a real-world situation or practice
Articulate what makes a particular course of action ethically defensible
Assess their own ethical values and the social context of problems
Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
Integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Unit I- Human Values:

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

Unit II – Engineering Ethics:

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

Unit III Engineering as Social Experimentation:

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons. Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.

2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

Unit IV

Engineers Responsibility for Safety and Risk: Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing riskSafety and the Engineer-Designing for the safety-Intellectual Property rights (IPR). Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

Unit IV

Global Issues: Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research. Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

TEXT BOOKS:

1."Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and, V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
2) "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3) "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGrawHill–2003.
4) "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5) "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M. Jayakumaran, Laxmi Publications.
6) "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by PS Murthy-BS Publication

IV IT - I SEMESTER

L - LECTURE T – TUTORIAL P – PRACTICAL CIA – Continuous Internal Assessment SEA – Semester End Assessment

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1		Managerial Economics and Financial Accounting	3	0	0	3	40	60	100	3
2		Cryptography and Network Security	2	0	2	4	40	60	100	3
3	PE-4	**Professional Elective -4**	3	0	0	3	40	60	100	3
4	PE-5	**Professional Elective -5**	3	0	0	3	40	60	100	3
5	OE-3	**Open Elective -3**	3	0	0	3	40	60	100	3
6	LAB	AI application development Lab	0	1	2	3	40	60	100	1.5
7	LAB	Predictive Analytics using R	0	1	3	4	40	60	100	2
8	LAB	Agile Software Development & Devops	0	0	2	2	40	60	100	1
9		Minor project ##	0	1	3	4	40	60*	100	2
10		Research Methodology	2	0	0	2	40	60*	100	-
Total			**16**	**3**	**11**	**30**	**400**	**600**	**1000**	**21.5**

Code	Professional Elective -4	Code	Professional Elective -5
	4.1 Natural Language Processing		5.1 Real Time Systems
	4.2 AR & VR		5.2 Data Science
	4.3 Block chain Technology		5.3 High performance computing
	4.4 Intelligent Systems		5.4 Machine Learning

* No External Evaluation

Head, IT Department
NRI Institute of Technology
POTHAVARAPPADU (
Agiripalli (M), Krishna Dist.

Course Code- Cryptography and Network Security

Lecture – Tutorial-Practical::		3	0	0	**Internal Marks:**	40
Credits:	3				**External Marks:**	60

Prerequisites:

Computer Networks, Arithmetic Calculations

Course Objectives:

- To present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking
- To understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA
- To present the basic principles of public key cryptography, Distinct uses of public key cryptosystems
- To Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature
- To Provide an overview of Key distribution and management, Email security, IP Security, web security, concept of firewalls, virus and Malicious code

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks.
CO2	Distinguish the black ciphers and stream ciphers and apply them on a various symmetric cryptographic techniques.
CO3	Understand the principle and mathematical models used in public-key cryptosystems by applying them on different (various) types of algorithms.
CO4	Analyze the message authentication functions with its types and digital certifications for secure communication.
CO5	Understand the user authentications principles and security approach at both the web and email.
CO6	Understand the concept of Email, IP, web Security with its services and dealing with the firewalls and Viruses

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PS

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	O3
CO1	3	2	-	-	-	2	-	-	-	-	-	-	3	-	2
CO2	3	3		2	-	2	-	-	-	-	-	-	3	-	2
CO3	3	3	-	2	-	-	-	-	-	-	-	-	3	2	-
CO4	3	3	-	2	-	-	-	-	-	-	-	-	3	2	2
CO5	3	2	-	2	-	-	-	-	-	-	-	-	3	2	2
CO6	3	2	-	2	-	-	-	-	-	-	-	-	3	2	2

UNIT I :

Introduction, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, **Classical Encryption Techniques**, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, **Symmetric Encryption**, Mathematics of Symmetric Key Cryptography, **Modern Symmetric Key Ciphers**, Data Encryption Standard, Advanced Encryption Standard, BlowFish, IDEA, CAST-128 algorithms

UNIT II:

Block Cipher Operations, Multiple Encryption and Triple DES, Electronic Codebook Mode, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode, **Asymmetric Encryption**, Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Key Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, Elliptic Curve Cryptography

UNIT III:

CRYPTOGRAPHIC DATA INTEGRITY ALGORITHMS, Cryptographic Hash Functions, Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), **Message Authentication Codes,** Message Authentication Functions, Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MACs Based on Block Ciphers: DAA and CMAC

UNIT IV:

Digital Signatures, ElGamal Digital Signature Scheme, Schnorr, Digital Signature Scheme, Digital Signature Standard (DSS), **Key Management and distribution**, **Electronic mail security**, PGP, S/MIME, IP Security, Web security, System Security, Intruders, Malicious Software, Viruses, Firewalls

TEXT BOOKS:

1. Cryptography And Network Security Principles And Practice 6th Edition, William Stallings, Pearson Education

2. Cryptography And Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, 3E) Mc Gra Hill

3. Atul Kahate, Cryptography and Network Security, TMH. (2003)

REFERENCE BOOKS:

1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition,2011, Pearson Education. 95
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

E-RESOURCES:

1. http://users.abo.fi/ipetre/crypto/
2. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
3. https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/
4. https://lecturenotes.in/subject/112/cryptography-and-network-security-cns
5. https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/
6. https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/
7. https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/

Course Code-NATURAL LANGUAGE PROCESSING

Lecture – Tutorial-Practical:: 3-0-0

Internal Marks: 40

Credits: 3

External Marks: 60

Prerequisites: :

Data structures, finite automata and probability theory

Course Objectives:

Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
CO2	Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
CO3	Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
CO4	Able to design, implement, and analyze NLP algorithms
CO5	Able to design different language modeling Techniques.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	2	2	3	-	2	-	-	-	-	-	-	-	3	3	2
CO2	2	3	3	-	2	-	-	-	-	-	-	-	2	-	3
CO3	-	2	2	2	3	-	-	-	-	-	-	-	2	-	2
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	2	2
CO5	-	2	2	3	3	-	-	-	-	-	-	-	2	2	2

UNIT I :

Introduction to Natural Language Processing: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background:An outline of English syntax

UNIT II:

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.
Ambiguity Resolution - Statistical Methods:Basic Probability Theory, Estimating Probabilities, Part-of-Speech Tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing

UNIT III:

Semantics and Logical Form: Word senses and Ambiguity, Encoding Ambiguity in theLogical Form, Thematic Roles, Speech Acts and Embedded Sentences, Defining Semantic Structure: Model Theory
Predicate-Argument Structure, Meaning Representation Systems, Software

UNIT IV:

Discourse Processing: Coherence, Reference Resolution, Discourse Cohesion and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, ParameterEstimation, Language Model Adaptation, Types of Language Models, Language-Specific ModelingProblems, Multilingual and Crosslingual Language Modeling.

TEXT BOOKS:

1.James Allen, "Natural Language Understanding", Pearson Education

2. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M.Bikel and ImedZitouni, Pearson Publication

3. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

REFERENCE BOOKS:

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson

Publications

2. Christopher D Manning and HinrichSchutze, "Foundations of Statistical Natural Language Processing" MIT Press, 1999.

3. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice

E-RESOURCES:

1. https://towardsdatascience.com/your-guide-to-natural-language-processing-nlp-48ea2511f6e1

2. . http://www.nptelvideos.in/2012/11/natural-language-processing.html

Course Code- Augmented Reality & Virtual Reality

Lecture – Tutorial-Practical:: 3-0-0 **Internal Marks: 40**

Credits: 3 **External Marks: 60**

Prerequisites: Computer Graphics

Course Objectives: This course provides students with an opportunity to explore the research issues Augmented Reality and Virtual Reality (AR &VR). It also makes the students know the basic concept and framew of virtual reality.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand Basics of Augmented Reality and Interactions. Fundamentals of Augmented , Mixed Reality a its features
CO2	Understand Basics of Virtual Reality and Interactions. Fundamental Concepts and Components of Virt Reality
CO3	Describe various input and output devices required for VR experience
CO4	Classify human factors that affect VR experience
CO5	Analyze the performance of various virtual reality applications.
CO6	Express the object position and orientation in virtual space.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	S O2
CO1	3	3	3	-	3	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	2
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	3	-	-	-	-	-	-	3	-	-
CO6	3	3	3	-	-	-	-	-	-	-	-	-	3	-

UNIT I :

Introduction to Augmented Reality -Augmented Reality Interactions, Monitor Based Displays, Head-mour Displays, AR Interaction, AR Tracking , Augmented and Mixed Reality, Technology and features of augmen reality, Typical AR Experiences, Difference between AR and VR, Challenges with AR, AR systems

UNIT II:

Introduction to Virtual Reality- Historical development of VR Fundamental Concept and Components of Virt Reality, Primary Features and Present Development on Virtual Reality, The three I's of virtual reality, commercial technology and the five classic components of a VR system

UNIT III:

Input Devices: Three-dimensional position trackers, navigation and manipulation, interfaces and gesture interfaces
Output Devices: Graphics displays, sound displays & haptic feedback

UNIT IV:

Human Factors: Methodology and terminology, user performance studies, VR health and safety issu
.pplications: Medical applications, military applications, robotics applications.
Virtual Space: Visual and object space, defining position and orientation in three dimensions

TEXT BOOKS:

1. Alan B. Craig, "Understanding Augmented Reality: Concepts and Applications", Newnes

2. William R. Sherman and Alan B. Craigm, "Understanding Virtual Reality " , Morgan Kaufmann Publishers

3. John Vince, "Virtual Reality Systems", Pearson Education.

4. Steve Aukstakalnis, "Practical Augmented Reality: A Guide to the Technologies, Applications, and Hun Factors for AR and VR", Addison-Wesley.

REFERENCE BOOKS:

1. Gregory C. Burdea & Philippe Coiffet, "Virtual Reality Technology", Second Edition, John Wiley & Sc Inc.

2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", Springer-Verlag London 2005

E-RESOURCES:

1. http://www.vrac.iastate.edu/

2.http://www.hitl.washington.edu/projects/education/pf/whatvr1a.htm

3. https://learn.unity.com/course/create-with-code 4. https://www.wikitude.com/smart-augmented-reality/

4. https://www.coursera.org/learn/ar

5. https://www.coursera.org/learn/handheld-ar

Course Code- BLOCKCHAIN TECHNOLOGY

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	4(
Credits:	3	**External Marks:**	6(

Prerequisites:

1. Knowledge in security and applied cryptography.

2. Knowledge in distributed databases.

Course Objectives:

- To Introduce block chain technology and Crypto currency
- Discuss the fundamental ideas of Bit coin MOOCs.
- Identify the different components of the block chain process.
- Recognize the differences between block chain and bit coin and other crypto currencies.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Learn about research advances related to one of the most popular technological areas today.
CO2	Demonstrate the block-chain services to develop a New Paradigm of Organizational activities
CO3	Learn the limitations of the block-chain mechanism to develop an efficient organizational structure
CO4	Applying Bit-Coin protocols and how to develop the digital currency in the websites

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2

UNIT I :

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency wo
Crowdfunding

UNIT II:

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockch
Environment

UNIT III:

Blockchain Science: Gridcoin, Foldingcoin, Blockchain Genomics, Bitcoin MOOCs.Currency, Token, Tokenizi
Campuscoin, Coin drop as a strategy for Public adoption.

UNIT IV:

Currency Multiplicity, Demurrage currency.
Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

TEXT BOOKS:

1. Blockchain Blue print for Economy by Melanie Swan

REFERENCE BOOKS:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher

E-RESOURCES:

1. Blockchain | Tools, Publications & Resources (ala.org)
2. Blockchain Learning Hub | UNICEF Office of Innovation

Course Code- INTELLIGENT SYSTEMS

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:** 4

Credits: 3 **External Marks:** 6

Prerequisites: NIL

Course Objectives:

This course is used to provide the description of agents and various types of agents and how they used to solve variou AI problems. This gives a clear view of analyzing AI problems, types of problems techniques of solving problems. gives a clear view of knowledge, representation of knowledge, types of logic and its algorithms. It provides a bett understanding of uncertainty and certainty, its factors various theories of uncertainty and appropriate examples.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explore various Artificial Intelligence problem solving techniques.
CO2	Identify and describe the different AI approaches such as Knowledge representation, Search strategie learning techniques to solve uncertain imprecise, stochastic and nondeterministic nature in AI problems
CO3	Apply the AI techniques to solve various AI problems.
CO4	Analyze and compare the relative challenges pertaining to design of Intelligent Systems.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	2	-	-	2	2	-	-	3	-	-	2	2	
CO2	2	-	-	-	-	-	-	3	-	3	-	-	2	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	3	-
CO4	-	-	-	3	-	-	3	-	-	-	3	-	-	3

UNIT I : Overview of Artificial Intelligence

Artificial Intelligence and its Application areas; Knowledge Representation and Search: The Predicate Calculus: Th Propositional Calculus, The Predicate Calculus, Using Inference Rules to Produce Predicate Calculus Expression Application: A Logic-Based Financial Advisor; Structures and strategies for state space search: Introductio Structures for state space search ,Strategies for State Space Search, Using the State Space to Represent Reasonir with the Predicate Calculus; And/or Graphs

UNIT II: Searching

Heuristic Search: Introduction, Hill Climbing and Dynamic Programming, The Best-First Search Algorithı Admissibility, Monotonicity and Informedness, Using Heuristics in Games, Complexity Issues. Control ar Implementation of State Space Search: Introduction, Recursion-Based Search, Production Systems, The Blackboa Architecture for Problem Solving.

UNIT III: Other Knowledge Representation Techniques

Semantic Networks, Conceptual Dependencies, Scripts and Frames, Conceptual Graphs. Knowledge Intensiv Problem Solving: Overview of Expert System Technology, Rule-Based Expert Systems, Model-Based, Case Base and Hybrid Systems Planning: Introduction to Planning, Algorithms as State-Space Search, Planning graphs

UNIT IV: Automated Reasoning

Introduction to Weak Methods in Theorem Proving, The General Problem Solver and Difference Tables, Resolutic Theorem Proving; Uncertain Knowledge and Reasoning: Introduction to Uncertainty, Inference using Full-Joi Distribution, Independence, Bayes' Rule and its use. Representing Knowledge in Uncertain Domain: Semantics Bayesian Networks, Efficient Representation of Conditional Distributions, Exact Inference in Bayesian Networ Approximate Inference in Bayesian Network

TEXT BOOKS:

1. Elaine Rich, Kevin Knight and ShivashankarB.Nair, —Artificial Intelligencel, TMH, Third edition, 2009.
2. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education Asia, Second edition, 2003.
3. N. P. Padhy, —Artificial Intelligence and Intelligent System, Oxford University Press, Second edition, 2005.

REFERENCE BOOKS:

1. Artificial Intelligence A Modern Approach, Stuart Russel, Peter Norvig, 3rd Edition, Pearson Publication, 2015, ISBN-13: 978-93-325-4351-5
2. Artificial Intelligence, Elaine Rich, Kevin Knight, 3 rd Edition, Tata McGraw Hill, 2009, ISBN-10: 0070087709, ISBN-13: 978-0070087705
3. Artificial Intelligence – Structures and Strategies for Complex problem Solving, George F Luger, 6th Edition. Pearson Publication, 2009, ISBN-10: 0-321-54589-3, ISBN-13: 978-0-321-54589-3
4. Intelligent Systems-A Modern Approach, Grosan, Crina, Abraham, Ajith, Springer-Verlag Berlin Heidelberg 2011, ISBN 9783642269394, 2011.

E-RESOURCES:

1. www.nptel.ac.in

2. https://www.britannica.com/technology/artificial-intelligence

3. https://www.tutorialspoint.com / Artificial Intelligence / AI – Overview

Course Code-Real Time Systems

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Computer Organization and Operating System, Microprocessor& Microcontroller

Course Objectives:

To provide broad understanding of the requirements of Real Time Operating Systems.

To make the student understand, applications of these Real Time features

Course Outcomes:

CO1	Understand concepts of Real time Systems and commands
CO2	Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt,latency and response time, and semaphores.
CO3	Discuss how tasks can communicate using semaphores, mailboxes, and queues.
CO4	Be able to explain how the real-time operating system implements time management.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
CO1	2	2	2	--	2	--	--	--	--	--	--	--	2	2	2
CO2	3	2	2	--	2	--	--	--	--	--	--	--	--	2	--
CO3	3	2	3	--	--	--	--	--	--	--	--	--	2	2	2
CO4	2	2	2	--	2	--	--	--	--	--	--	--	2	2	2

UNIT I :

Introduction

Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write),

Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT II:

Real Time Operating Systems

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, defining a Task, asks States and Scheduling, Task Operations, Structure,Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage Operations and Use

UNIT III:

Objects, Services and I/O

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT IV:

Exceptions, Interrupts and Timers

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers.

TEXT BOOKS:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

REFERENCE BOOKS:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.

2. Advanced UNIX Programming, Richard Stevens

3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh

E-RESOURCES:

1. https://www.guru99.com/real-time-operating-system.html
2. https://www.tutorialspoint.com/Real-Time-Embedded-Systems
3. https://nptel.ac.in/courses/106/105/106105036/

COURSE CODE- DATA SCIENCE

Lecture – Tutorial- Practical:: 3-0-0 **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: Linear Algebra, Descriptive Statistics, Data Mining, Python, R

Course Objectives: To learn the fundamentals of Data Science, Data Extraction and Pre-Processing Method Model Development, and Evaluation with Descriptive Statistics.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1 Able to learn fundamentals of Data Science.

CO2 Understanding different Data collection and Pre-Processing methods.

CO3 Understanding the use of various Descriptive Statistics.

CO4 Analyzing various Data analytics techniques.

CO5 Use of Regression Techniques.

CO6 Evaluation of Various Models.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PS 3
CO1	3	2	2	2	2	2	--	--	--	--	--	--	2	2	3
CO2	2	2	3	2	2	--	--	--	--	--	--	--	2	2	2
CO3	2	2	3	2	2	--	--	--	--	--	--	--	3	3	2
CO4	3	3	2	3	3	3	--	--	--	--	--	--	2	3	2
CO5	3	3	2	3	3	3	--	--	--	--	--	--	2	3	2
CO6	2	2	2	3	3	3	--	--	--	--	--	--	2	3	3

UNIT I: INTRODUCTION TO DATA SCIENCE

Introduction to Data Science: Evolution of Data Science, Data Science Roles, Stages in a Data Science Projec Applications of Data Science in various fields, Data Security Issues.

UNIT II: Data Collection and Data Pre-Processing

Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Da Reduction, Data Discretization.

UNIT III: Descriptive Statistics and Exploratory Data Analytics

Mean, Standard Deviation, Skewness, Kurtosis, Correlation, ANOVA, Box Plot, Histogram, Scatter Plot, Multi-va chart, Pivot Table, Heat Map.

UNIT IV: Model Development and Evaluation

Regression Techniques: Linear, Multiple, K-Means.Evaluation Techniques: Precision, Recall, F1-Score, R-Squar MAE, MSE, RMS, Residual Plots, Distribution Plots, Cross-Validation, Prediction.

TEXTBOOKS:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science," PACKT, 2016.

2. Cathy O'Neil and Rachel Schutt, "Doing Data Science," O'Reilly, 2015.

3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

4. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics," IGI Global

REFERENCE BOOKS:

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013

2. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics," IGI Global

E-RESOURCES:

1. https://nptel.ac.in/courses/106/106/106106179/
2. https://www.coursera.org/browse/data-science
3. https://swayam.gov.in/explorer

COURSE CODE- HIGH PERFORMANCE COMPUTING

Lecture – Tutorial- Practical::	**3**	**0**	**0**	**Internal Marks:**	40
Credits:3	**03**			**External Marks:**	60

Prerequisites:

Course Objectives:

The main objective of this course is to make the students familiar with High Performance Computing Principles and its environment.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Analyze the functionality of Modern Processor.
CO2	Comprehend and implement various optimization techniques for serial code.
CO3	Design the concept of parallel computing and Programming.
CO4	To study about memory parallel programming using open MP and MPI

Contribution of Course Outcomes towards achievement of Program Outcomes

(1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	--	--	2	--	--	--	2	--	--	--	--	2	--	--
CO2	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--
CO3	2	--	--	--	--	2	--	--	--	2	--	-	2	--	--
CO4	--	2	--	--	3	--	--	2	--	--	--	--	--	--	2

UNIT I : Modern Processors: Stored Program Computer Architecture, Architecture of microprocessor based on cache- Performance based metrics and benchmarks, Moore's Law, Pipelining, Super scalarity, SIMD, Different classes of Memory- cache, mapping, pre-fetch ,Introduction to different types of processor such as Multicore processors, Multithreaded processors, Vector Processors

UNIT II: Requirements and General Issues: Scalable parallel computer Architectures, A cluster computer and its Architecture, clusters classifications, Commodity components for clusters, Network services/Communication SW, Cluster middleware and single system Image(SSI),Resource Management and Scheduling(RMS),Programming environments and Tools, Representative cluster Systems. High speed Networks: Design issues, Fast Ethernet, High Performance parallel interface (HPPI), Asynchronous transfer

mode (ATM), Myrinet.

UNIT III: Parallel Computers: Taxonomy of parallel computing paradigm, Different types of memory computers such as Shared memory computers, Distributed memory computers, Hierarchical systems, Basics of parallelization.

Parallel Scalability- Factors that limit parallel execution- Scalability metrics- Simple scalability laws- parallel efficiency - serial performance Vs Strong scalability- Refined performance models- Choosing the right scaling baseline- Case Study: Can slow processors compute faster- Load balance

UNIT IV: Distributed memory parallel programming with MPI: Brief introduction to MPI such as messages and point-to-point communication - collective communication – Non blocking point-to-point communication- virtual topologies, MPI parallelization of Jacobi solver- MPI implementation - performance properties .MPI performance tools, communication parameters, Synchronization, serialization.

TEXT BOOKS:

1.Georg Hager, Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall / CRC Computational Science series

2. Gene Wagenbreth and John Levesque, High performance Computing: Programming and Application, CRC press, Taylor and francis group

3.MaciejBrodowicz, Matthew Anderson, and Thomas Sterling, High Performance Computing: Modern Systems and Practices,Morgankaufmann publishers

REFERENCE BOOKS:

1. Charles Severance, Kevin Dowd, "High Performance Computing", O'Reilly Media, 2nd Edition, 1998.

2. Kai Hwang, Faye Alaye Briggs, "Computer Architecture and Parallel Processing", McGraw Hill, 1984.

E-RESOURCES:NPTL Videos And IEEE Journals,

1.https://www.intel.com/content/www/us/en/high-performance-computing/processors.html

2.https://www.usgs.gov/core-science-systems/sas/arc/about/what-high-performance-computing

3. https://en.m.wikipedia.org/wiki/Parallel_computing

4. https://www.open-mpi.org/

Course Code- MACHINE LEARNING

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: linear algebra, probability and statistics

Course Objectives:

To provide knowledge about data preprocessing and its uses in prediction
How linear models are learning from the data.
Improving efficiency of the models using nonlinearity and ensembles
How neural networks help in increasing efficiency

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understanding the machine learning basics and how data is preprocessed
CO2	How linear models help in prediction
CO3	Distance based models complexity
CO4	Probabilistic models understanding
CO5	Nonlinear models and ensembles improve efficiency
CO6	How neural network provide nonlinearity

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PS
CO1	2	--	2	3	3	--	--	--	--	--	--	--	2	2	--
CO2	--	--	2	2	2	--	--	--	--	--	--	--	--	2	3
CO3	--	--	2	3	2	--	--	--	--	--	--	--	--	2	2
CO4	2	--	3	2	2	--	--	--	--	--	--	--	--	3	--
CO5	2	--	2	2	2	--	--	--	--	--	--	--	2	--	--
CO6	2	--	2	--	2	--	--	--	--	--	--	--	--	2	2

UNIT I :The Ingredients of Machine Learning: Introduction to Machine Learning, Types of Machine Learni Models - The output of Machine Learning Binary Classification and related tasks: Classification, Calculating accur in classification. Natural Language Processing (NLP): Text data preprocessing, Bag of words, TF IDF, Word2v

Plane and Hyper-plane for machine learning, Data Cleaning, Data Preprocessing (Min – Max Scaling), Normaliz Standardize, Mean, Variance, Standard Deviation, One Hot Encoding

UNIT II:

Beyond Binary Classification: Handling more than two classes, finding minimum and maximum of a functi Gradient Descent, Linear Regression, Multiple Regression, Calculating accuracy in regression (RMSE), Effect outliers and noisy data, overfitting and underfitting models, K-fold cross validation, confusion matrix for cı validation.Logistic Regression: Sigmoid function in logistic regression, loss functions in logistic regression. Lir Models: The Least Square method, Support Vector Machine (SVM)

UNIT III:

Tree Model: Decision Trees, Ranking and Probability estimation trees,

Distance Based Models: Distance Measures (Euclidean, Manhattan and Minkowski), Neighbors, KNN, Dista based clustering, Hierarchical Clustering, Agglomerative Clustering

Probabilistic model: Naive Bayes algorithm for classification, Laplace, smoothing

Model Ensembles: Bagging and Random Forest, Boosting

UNIT IV:

Dimensionality Reduction: Principal Component Analysis (PCA), Implementation and demonstration.

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural netw learning, Multilayer networks and the back propagation algorithm.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambrid
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

E-RESOURCES:

AI APPLICATION DEVELOPMENT LAB

Lecture – Tutorial- Practical::	0-1-2	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites:

Artificial intelligence concepts, Data mining, programming language

Course Objectives:

1 Able to demonstrate proficiency in modern AI and machine learning techniques
2 Able to design and implement effective AI solutions to various applications, conduct proper evaluations, and refine the AI solutions.
3 Able to effectively train various machine learning models with modern hardware and software platforms
4 Able to effectively deploy various machine learning models for different user platforms
5 Able to demonstrate good mastery of modern AI and machine learning techniques

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Describe various machine learning algorithms for AI applications
CO2	Describe the development lifecycle of AI applications
CO3	Describe the principles of AI for IoT applications
CO4	Collect data from Internet and perform data preprocessing
CO5	Identify suitable machine learning models for AI applications
CO6	Develop software programs to effectively train machine learning models for AI applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	3	3	2	-	-	-	2	-	-	2
CO2	3	3	3	3	3	-	-	2	2	-	-	2
CO3	3	3	3	3	3	-	-	2	2	-	-	2
CO4	3	3	3	3	2	-	-	-	2	-	-	2
CO5	3	3	3	3	3	-	-	-	2	-	-	2
CO6	3	3	3	3	2	-	-	-	2	-	-	2

I. Programming for AI Applications
A. Data Collection and Preprocessing
B. Training of Machine Learning Models
C. Evaluation of Machine Learning Models
D. Deployment of Machine Learning Models
E. Distributed Computing for AI

II. AI Software Engineering
A. AI Software Development Lifecycle
B. Data Management for AI
C. Cloud and Edge Computing for AI

III. AI for IoT
A. Foundations of IoT
B. AI for Industrial IoT
C. AI for Smart Cities IoT

IV. AI Group Project with one or more of the following selected topics:
A. Computer Vision
B. Natural Language Processing
C. AI in Healthcare
TEXT BOOKS:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Editio 2019
2. Eli Stevens, Luca Antiga, and Thomas Viehmann, Deep Learning with PyTorch, Manning Publication 2020
3. Amita Kapoor, Hands-on Artificial Intelligence for IoT: Expert Machine Learning and Deep Learning Techniques for Developing Smarter IoT Systems, Packt Publishing, 2019

REFERENCE BOOKS:

1. V Kishore Ayyadevara, Yeshwanth Reddy, Modern Computer Vision with PyTorch, Packt Publishing, 2020
2. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, Practical Natural Language Processing, O'Reilly, 2020
3. Arjun Panesar, Machine Learning and AI for Healthcare, 2nd Edition, Apress, 2020

E-RESOURCES:

1. https://www.coursera.org/learn/ai-programming
2. https://www.ai-project.org/

Course Code- Predictive Analytics Using 'R'

Lecture – Tutorial- Practical:: 0 -1-2 **Internal Marks:** 4(

Credits: 2 **External Marks:** 6(

Prerequisites: Linear Algebra, Descriptive Statistics, Data Mining, 'R'

Course Objectives: To learn various Data Analytics Approaches with Classification and Regression Techniq and Predict the given outcomes.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Able to Implement Linear and Multiple Regressions.
CO2	Able to Estimating Probabilities using a logistic function and the prediction of Categorical placement.
CO3	Able to build Various Time-series models.
CO4	Able to implement the applications single and multiple decision trees.
CO5	Able to build multiple Linear regression models across the range of predictor values.
CO6	Able to know outcome variable's values.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	P 3
CO1	3	2	2	2	2	2	--	--	--	--	2	--	2	2	3
CO2	2	2	3	2	2	--	--	--	--	--	2	--	2		2
CO3	2	2	3	2	2	--	--	--	--	--	2	--	3	3	2
CO4	3	3	2	3	3	3	--	--	--	--	2	--	2	3	2
CO5	3	3	2	3	3	3	--	--	--	--	2	--	2	3	2
CO6	2	2	2	3	3	3	--	--	--	--	2	--	2	3	3

List of Experiments

1. Implementation of Linear Regression.
2. Implementation of Multiple Regression.
3. Implementation of Logistic Regression.

4. Implementation of Multinomial Logistic Regression.
5. Implementation of Probit Regression.
6. Implementation of Auto-Regressive Time-Series Model.
7. Implementation Moving-Average Time-Series Model.
8. Implementation of Decision Tree Regression.
9. Implementation of Random Forests.
10. Implementation of the Overfitting Regression Model.
11. Implementation of Multivariate adaptive regression splines.
12. Implementation of CART Classification Model.

TEXT BOOKS:

1. Predictive Analytics using 'R' by Jeffery S.Strickland.

2. R: Predictive Analysis by Tony Fischetti, Eric Mayor, Rui Miguel Forte, Packet Publishing.

REFERENCE BOOKS

1.Data Science and Predictive Analytics, Biomedical and Health Applications using R by Ivo D. Dinov

E-RESOURCES

1. www. onlinecourses.nptel.ac.in/noc20_mg24/preview.
2. www.coursera.org/learn/predictive-modeling-analytics.
3. https://onlinecourses.swayam2.ac.in/imb21_mg20/preview.

Course Code- Agile Software Development & Devops - LAB

Practical:: 0-0-2 **Internal Marks:** 1

Credits: 1 **External Marks:** 3

Prerequisites: Software Engineering , Software Project Management

Course Objectives:

Course Objectives: Course Objectives: This course makes student learn the fundamen principles and practices associated with each of the agile development methods. To apply t principles and practices of agile software development on a project of interest and relevance the student.

Course Outcomes:

Course Outcomes: Agile Software Development: Basics and Fundamentals of Agile Process h. .ho Values of Agile, Principles of Agile, stakeholders, Challenges

Upon successful completion of the course, the student will be able to:

CO1	Analyze existing problems with the team, development process and wider organization
CO2	Apply a thorough understanding of Agile principles and specific practices
CO3	Select the most appropriate way to improve results for a specific circumstance or need
CO4	Judge and craft appropriate adaptations to existing practices or processes depending upon analysis typical problems
CO5	Evaluate likely successes and formulate plans to manage likely risks or problems
CO6	Create high quality applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	2	2		2			2					3	2
CO2	3	2	2				2					2	3	2
CO3	2	2	2										2	2

CO4	2	2	3				2			2	2
CO5	2	2	2					2		2	
CO6	2	2	2							2	2

List of Programs :

1: Railway Commodity Reservation System - CO1
2: Multimedia Content Protection System - CO 2
3: Delivery Agent System - CO3
4: Social Networking - CO1
5: Online Campus Security Management System – CO4
6: Airline Management System - CO 5
7: Here I Am - CO 6
8: Hall Management System - CO3
9: E-Wallet Management System - CO 4

PROGRAM 1

1: Railway Commodity Reservation System

Rail communication is an old-age and proven to be the safest mode of transportation. Further, Indian railway is one of the largest railway network in India. We are aware that for the Indian railways, there is a number of passenger reservation system known to the rail passengers and out of which the IRCTC RPS is the most sophisticated one and the most popular among public. In parallel to public transportation, Indian railways is also very much effective for commodity transportation. However, Indian railways is yet to launch any reservation mechanism for commodity transportation. This proje is to take up this limitation and propose to develop a commodity reservation system.

Input:
• A database stating the network of transportation connectivity by rail cargos.
• Different cargos and their rout of movements, schedule, cost of transportation, whether express or normal service etc.

Functions:
• Availability check
• Booking a transportation
• Canceling a transportation

Output:
• Results on availability for a given date with capacity
• Booking confirmation
• Cancellation of an existing booking and confirmation

Program II :

2: Multimedia Content Protection System

Multimedia information like text, audio, video and any combination of those are most pervasive in almost every application fields namely Computer, Network, Smartphone and elsewhere. We also require a high degree of privacies of our own document. There is a problem that how such a documen can be protected from unauthorized access. Of course, there are many methods such as using passwo smartcard, biometrics, etc. are known. Nevertheless, the existing methods have their own limitations robustness and cost issues. This project would aim to devise a (new) method and develop a user friendly and cost effective solution to the problem.

Input:

- A detail profile of the user, who wish to protect the document. The profile template will be finalized after a careful discussion with the team member (i.e., software engineer here).
- If any other input that might require.
- Document itself to be protected.

Functions:

- Encryption of document
- Decryption of document
- Opening a document under protection
- Deleting a document under protection
- Copying a document under protection

Output:

- Document after encryption
- Document after decryption
- Result on opening a document: success or failure; locking for three unsuccessful attempts
- Results on deleting a document under protection: success or failure; locking for three unsuccessful attempts
- Results on copying a document under protection: success or failure; locking for three unsuccessful attempts

Program 3

3: Delivery Agent System

There are many online shopping portals such as Flipkart, Amazon, Snapdeal, etc. are active in the Indian market. One major task is to deliver an online books products to the customers as first as possible in a cost-effective (cheapest) manner. A delivery agent system, which would automatically receive a delivery request from an online portal and identify the couriers, whom the delivery job can be assigned.

Input:

- Shipping details (source and destination) locations
- Couriers' details in different localities.
- Service offering for each courier company.

Functions:
- Booking delivery
- Status of delivery
- Cancellation of booking
- Delivery rescheduling
- Reward and penalty calculation
- Archiving record of past services

Output:
- Booking confirmation, if booking is successful.
- Reporting delivery status
- Cancellation of booking confirmation
- Update record on delivery rescheduling
- Update record and intimation on reward and penalty calculation
- Query generation on record of past service, given a courier agency.

Program 4: Social Networking

We are living in the age of Social Networking like Facebook, LinkedIn, Google + etc. The objective is to develop a social networking application, which has the following basic features:

Operations:

- User can register into the application with their name, email id and password.

Registered user may be able to login into the application.

- There should be options to get the basic information like date of birth, address, phone no, education, upload his/her picture, professional information, hobby etc.
- After login, user should be able to see their profile information.
- One should be able to add new friends.
- One should be able to see the basic profile information of their friend.
- One should be able to send messages to their friends.

Note: You can add other features, as you are familiar with different social networking sites and

activities. Above points are only a few basic ideas of any social networking application.

Program 5: Online Campus Security Management System

An organization has more than thousand security persons, who are instructed to give duties at different places within the campus. Additionally, they also maintain a routine, which contains all information, such as Date, Duty Start Time, Duty End Time, and Place. Most importantly, all the places are covered by at least one security person. If a security person takes leave, manual entry is done against that person. Finally, at the end of a month, the security persons get paid for their duties, while considering the number of leaves as well. You can see that the manual calculation/operation is a heavy task for the security manager. Therefore, the objective is to build an Online security management system through which entire security system within the campus can be controlled in an efficient manner.

Inputs:

- User Information
  - Security – (Name, Identity Number, Password)
  - Total number of security persons
  - Manager – (Name, Identity, Password)
- Place Information
  - Number of places identified by unique numbers

Operations:

- Security Person
  - Log-In
  - View duty date, place, start time, end time (upcoming 7 days schedule can be viewed)
  - Request manager to take leave or to do over duty
  - Request approved/declined
  - Number of leaves taken/ number of allowed leaves remaining
  - Log-Out

- Manager
  - Log-In
  - Create routine for upcoming 7 days for all persons considering leave requests
  - Approve/decline leave request
  - Monitoring
  - Log-Out

Outputs:

- Salary at the end of the month
- View routine

Constraints:

All users MUST register themselves into the system.

- A security person can only check his/her own routine.
- Manager can check the status of all security persons.
- A fixed number of leaves are allowed. Beyond that, fixed amount will be deducted as fine.
- All security persons get same number of duties in a month.
- Adequate number of security persons are there to cover all places considering leave requests.
- A security person must not have duties in two different places at the same date and time.

Program 6: Airline Management System

Airline Management System is a dedicated and highly configurable system for all airlines, which can be easily accessed by all users. It helps the users to book flights without visiting offline booking counters. This system can be accessible by any user from any location at any time. In such a system, a passenger should be able to view the availability of flights' details, as per their requirement. They can book the flights online and can also cancel the reservation. The administrator manages the passenger booking system and updates the reservation status.

Inputs:

- User Information
  - Passenger (Name, Email id, Password, Passport No, Passenger ID, Flight No, Source, Destination, Date, Time)
  - Administration (Admin_ID, Name, Email id, Contact no, Password).
- Flight Information
  - Domestic Flight(Type of Flight, Flight No, Source, Destination, In between stations, Date, Time, Type of class, Meal, Amount)
  - International Flight(Type of Flight, Flight No, Source, Destination, In between stations, Date, Time, Type of class, Meal, Amount)

Operations:

- Administrator
  - Login
  - Manage passengers
  - Update the passenger's status
- Passenger
  - Login
  - Edit Profile
  - Request: to view the available flights as per requirement
  - Request for reservation
  - Ticket cancellation

Output:

- Display the available flights as per the user's requirement
- Display the confirmation of reservation (Display record/Error message)
- Print the ticket

Constraints:

- All the passengers must register themselves into the system.
- Login information contains only passenger id and password.
- To view the available flight details, passenger has to give source, destination, and date and time.
- After confirmation of reservation request, passenger can see the status.

Program 7 :Here I Am

"Here I Am" is all about a virtual friend who will assist in your daily life. Basic block of this idea is to build an application which acts as a personal assistant of users. How it works? Initially user has to feed .e general information of themselves like age, sex, profession, hobby, education, information about work etc. Based on these input data, it helps user to maintain his/her daily activity, schedule, appointment etc. Some key features are stated below. The given key features are the basic guideline.

1. General information: This option takes the basic input of the user. It helps get the information about yourself like your personal data (generally the information which you give in social networking sites). This general information can be broken up like:

a) Personal data: Name, sex, date of birth, email id, phone no., address, likes , dislikes etc.

b) Education: User's educational background.

c) Professional information: Basic information about user's profession. Name of the organization, your designation, role etc.

d) Output: Based on the detail information about the user the application should generate the documented personal details like CV for that user.

2) Reminder: User can store his/her important schedule and gets the alert or notification of it.

a) Input: User should have the option to enter the important dates, time and the brief about the event and save it.

b) Output: User can search a particular date and see if there is any schedule for that date.

Some advances features:

1. User can search the information in web.

2. You can upload files, pictures etc. for future work. User can access those files or picture later.

3. Tracks the past records of user are meeting activities, so that user can see the past records as well.

4. Option to take a note of content of any conversation or meeting and save it to file. He or she can able to access those files in future.

Note: Since you are going to develop a web application for this, it is suggested to create a login option for multiple users. So that multiple user can register into this application and get their spaces. So you need to provide an option to register in the application for new user. Once they register, they will able to login.

Above points are the basic guide lines for the application. It is expected from you that you are going add more features and make the application more useful and interesting.

Program P8: Hall Management System

1 Problem Description

In a hall management system like that of IIT KGP, students are accommodated in 20 Halls of Residence which are managed by HMC. These halls are administered by Wardens and Assistant Wardens (Mess, Maintenance, Allotment) with help of hall managers and supervisors.

Catering service is provided by the regular hall staff members in some of the halls, and for the remaining halls it has been outsourced to private agencies. Cleaning service is outsourced for all the halls of residence. Activities related to Mess operations and monitoring, sports and games, cultural events, library etc. are managed by various elected general secretaries and overseen by The Hall President.

You are required to design an equivalent Hall Management System (HMS). Some of the use cases are given in the next section. Your system should not be limited to the given use cases. Add more attractive features.

2 Use Cases for the HMS

2.1 Initial Hall Allocation

- The student pays the admission fees via ERP.
- ERP profile is generated and hall is allocated based on the student's category (BTech, MTech, MS or Phd).
- On the day of admission, the student submits the required documents at the hall and is allocated a room (single or sharing).

2.2 Change Hall

- HMC advertises for filling up vacant rooms in various halls.
- Student submits application.

New hall is allocated based on seniority.

Variation: Mutual Change (Swapping) of Halls

- HMC advertises for mutual change (swapping) of halls.
- Two consenting bachelor students A and B fill up a common form.
- If student A from hall X is allowed to swap with student B from hall Y, then A will move to hall Y and occupy the same room allotted where B was staying and B will be allotted the room where A was staying. In hall X, the mess bill and other dues of student A will be levied on student B and in hall Y, the mess bill and other dues of student B will be levied on student A.

2.3 Submit a Complaint Related to Maintenance

- Student submits a complaint letter to hall manager/supervisor.
- If it is an addressable complaint, the hall manager/supervisor forwards it to Assistant Warden (maintenance).
- Assistant Warden (maintenance) addresses the problem with the help of HMC.

2.4 Submit a Complaint Related to Mess

- Student submits a complaint letter to General Secretary (Mess)/ writes in the complaint register.
- If it is an addressable complaint, General Secretary (Mess) forwards it to Assistant Warden (Mess).

• Assistant Warden (Mess) addresses the problem with the help of HMC.

2.5 Booking Guest Room in Hall

• Student submits an application to hall manager mentioning the duration and dates.

• If guest room is available for the requested time period, the hall manager approves the request.

3 Some Other Operations of the HMS

• Maintenance of student record.

• Maintenance of HMC employee record.

• Generating alert messages (or emails) for due fee payment.

• Display of general information of a hall.

• Query regarding vacancy in a hall.

• Query regarding staff recruitment (catering/cleaning) in a hall.

P10: E-Wallet Management System

(TA: Ilora Maity)

1 Problem Description

E-wallet is an online prepaid account where one can stock money, to be used when required. As it is a pre-loaded facility, consumers can buy a range of products from airline tickets to grocery without swiping a debit or credit card.

You are required to design a similar E-Wallet Management System (EMS). Some of the use cases are given in the next section. Your system should not be limited to the given use cases. Add more attractive features.

2 Use Cases for the EMS

2.1 Load E-Wallet

Customer loads his wallet via Credit/Debit card, Net Banking, IMPS or ATM card. The money is deposited with the Escrow bank (this is to ensure EMS does not cheat its customers).

Each Wallet is of two types:

• Minimum KYC Wallet: Minimum KYC wallet customers have to verify their mobile numbers and email (optional). Minimum KYC wallet customers can add a maximum of Rs 10,000 in a

calendar month in their wallet. They can send money to other e-wallet customers not exceeding Rs 25,000 in a calendar month. They can also send money from their e-wallet to any bank account not exceeding Rs 25,000 in a calendar month. The total amount of of money that can be sent to another e-wallet customer and to a bank account can not exceed Rs 25,000 in a calendar month.

• Full KYC Wallet: Full KYC Wallet customers can hold a maximum amount of Rs 100,000 in their e-wallets at any point in time. There is no limit to the amount of money that can be added in a Full KYC e-Wallet as long as the total amount in the e-wallet does not exceed Rs 100,000. This means that Full KYC Wallet customers can spend much more than Minimum KYC Wallet customers and can also receive more cashback without crossing their wallet's monthly limits.

ıll KYC Wallet customers can send money to other e-wallet customers not exceeding Rs 25,000 in a calendar month. They can also send money from their e-wallet to any bank account not exceeding Rs 25,000 in a calendar month. The total amount of of money that can be sent to another e-wallet customer and to a bank account can not exceed Rs 25,000 in a calendar month.

2.2 Pay Merchant

1. P2P transaction

1. Merchant shares his number with customer or the customer scans the merchant's code.

2. Customer transfers the money to the merchant's wallet in accordance with the KYC status of the merchant.

2. P2M transaction

1. The merchant registers with the Escrow Bank.

2. e-wallet Data Center collects KYC documents and bank details of the merchant and registers merchant with the Escrow Bank.

3. When customer pays merchant, customer's wallet is debited and a notification is sent to Escrow bank.

4. The escrow bank then transfers this money into the bank account of merchant registered with it.

2.3 Transfer Money from E-Wallet to Bank Account

1. Log in to EMS.

2. Select `Send' option.

3. Select `Send to Bank' option.

4. Enter the Name you want to give to this beneficiary.

5. Enter the account number.

6. Enter the IFSC code of the branch. You can select the IFSC code from a dropdown.

7. Enter the amount you want to send. Minimum amount should be Rs xxx.

8. You can also enter the reason for sending money, however this is optional.

9. Select Send. Your money will be successfully transferred to the bank account.

3 Some Other Operations of the EMS

• View Passbook: Shows e-wallet balance.

• Upgrade Wallet: Wallets can be upgraded from minimum KYC to full KYC by providing full KYC details to the e-wallet Data Center.

Reference: https://paytm.com/care/paytmwallet/

Reference Agile Software Tools : 1. Zepel

2. JIRA

3. Trello

4. Github Project Management

5. Pivotal Tracker

6. Orangescrum

7. Kanbanize

8. ActiveCollab

9. Wrike

10. Backlog

11. Sprintly

NRIA18 : ACADEMI CURRICULUM FOR B.TECH (INFORMATION TECHNOLOGY)

IV IT - II Semester

L - LECTURE T – TUTORIAL P – PRACTICAL CIA – Continuous Internal Assessment SEA – Semester End Assessment

Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	PE-6	**Professional Elective-6**	3	0	0	3	40	60	100	3
2	OE-4	**Open Elective-4**	3	0	0	3	40	60	100	3
3		Major Project (Internal/Industry Internship) dissertation***	0	5	7	12	40	60	100	8
Total			**6**	**5**	**7**	**18**	**120**	**180**	**300**	**14**

Code	Professional Elective - 6
	6.1 Deep Learning
	6.2 System Modeling and Simulation
	6.3 Social Networking and Semantics
	6.4 Cyber Forensics

* Professional Elective- 6 and OE-4 is offered through blended learning method. Regular classes as well as online classes will be conducted as per the choice of the students (moocs). However, students will have to write their regular exam at the end semester.

** Internship or Professional certification courses may be opted as self-learning course. Students register and complete the opted course in approved technology platform on or before Last Instruction Day of VIII Semester. They have to submit the certificate before the last Instruction Day of VIII Semester.

Technical Writing/Paper publication in a reputed journal can be done on or before Last Instruction Day of VIII Semester.

Head, IT Department
NRI Institute of Technology
POTHAVARAPADU (V)
Agiripalli (M), Krishna Dist.

IV YEAR II SEMESTER

Course Code-DEEP LEARNING

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Statistics, Calculus, Linear Algebra and Probability

Programming Knowledge

Data Modeling

Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Convolutional Networks,Autoencoders.
- To gain knowledge to apply optimization strategies

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic concepts of neural network, its applications and various learning models
CO2	Acquire the knowledge on Recurrent, Recursive Nets and Auto-encoder models
CO3	Analyze different Network Architectures, learning tasks, Convolutional networks
CO4	Use an efficient algorithm for Deep Models
CO5	Apply optimization strategies for large scale applications

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	3	2	3	3	2	2	--	--	--	--	--	--	3	2	2
CO2	2	3	3	2	2	2	--	--	--	--	--	--	2	2	2
CO3	3	3	2	2	2	3	--	--	--	--	--	--	2	2	3

CO4	3	3	3	2	3	3	--	--	--	--	--	--	3	2	3
CO5	3	3	2	3	2	3	--	--	--	--	--	--	3	2	2

UNIT I :

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Multilayer Perceptron, Example: Learning XOR ,Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and OtherDifferentiation Algorithms

UNIT II:

Convolutional Networks: Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the basic convolution function, Structured Outputs, Data types, Efficient Convolution Algorithms, Random or Unsupervised features, The Neuroscientific basis for convolutional networks

UNIT III:

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, The Long Short-Term Memory and Other Gated RNNs

UNIT IV:

Autoencoders: Undercomplete Autoencoders, Regularized Autoencoders, Representational Power, Layer Size and Depth, Stochastic Encoders and Decoders, Denoising Autoencoders, Contractive Auto encoders, Applications of Autoencoders

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms,Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language

Processing

TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville

2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

3. Deep Learning (Adaptive Computation and Machine Learning Series), Ian Good Fellow, Yoshua Bengio and Aaron Courville, MIT Press (3 January 2017), ISBN-13: 978-0262035613.

4. Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, Nikhil

Buduma, by O'Reilly Publications, 2016 Edition, ISBN-13: 978-1491925614.

REFERENCE BOOKS:

1. Introduction to Artificial Neural Networks, Gunjan Goswami, S.K. Kataria & Sons; 2012 Edition, ISBN-13: 978-9350142967

Course Code-SYSTEM MODELLING AND SIMULATION

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	4(
Credits:	3	**External Marks:**	6(

Prerequisites:

Course Objectives:

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Explain the basic system concept and definitions of system
CO2	Discuss techniques to model and to simulate various systems
CO3	Analyze a system and to make use of the information to improve the performance
CO4	Illustrate the operation of a dynamic system and make improvement according to the simulation results.
CO5	Describe the behavior of a dynamic system and create an analogous model for a dynamic system
CO6	Explain the system concept and apply functional modeling method to model the activities of a static systen

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – Hig

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	-	3	-	2	-	-	-	2	-	-	2	2	-
CO2	2	-	-	-	-	-	-	2	2	-	-	2	3	-
CO3	3	-	-	-	-	-	-	2		-	-	-	-	2
CO4	-	2		3	-	-	-	-		-	-	2	-	-
CO5	3	-	3	-	--	-	-	-	2	-	-	-	3	2
CO6	2	-	--	-		-	-	-	2	-	-	2	-	2

UNIT I :

Introduction: When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvanta

of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulat Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet.

General Principles, Simulation Software: Concepts in Discrete-Event Simulation: The EventScheduling / Ti Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Ja Simulation in GPSS

UNIT II:

Statistical Models in Simulation: Review of terminology and concepts; Useful statistical models; disc distributions; Continuous distributions; Poisson process; Empirical distributions
Queuing Models: Characteristics of queuing systems, Queuingnotation, Long-run measures of performance queuing systems, Long-run measures of performance of queuing systems cont...., Steady-state behavior of M/ queue, Networks of queues
UNIT III:

Random-Number Generation:Properties of random numbers; Generation of pseudo-random numbers, Techniq r generating random numbers, Tests for Random Numbers

Randon Variate Generation:Inverse transform technique Acceptance-Rejection technique.

Verification, Calibration and Validation: Optimization: Model building, verification and validation, Verificatio simulation models, Verification of simulation models, Calibration

UNIT IV:

Input Modeling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Te fitting a non-stationary Poisson process, Selecting input models without data, Multivariate and Time-Series in models.

Estimation of Absolute Performance: Types of simulations with respect to output analysis, Stochastic nature output data, Measures of performance and their estimation, ; Output analysis for terminating simulations; Out alysis for steady-state simulations.

TEXT BOOKS:

Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5 th Editi Pearson Education, 2010.

REFERENCE BOOKS:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson Education, 2006.

2. Averill M. Law: Simulation Modeling and Analysis, 4th Edition, Tata McGraw-Hill, 2007

Course Code- Social Networking and Semantics

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

1. Knowledge in Networks

2. Knowledge in distributed databases.

Course Objectives:

- To learn Web Intelligence
- To learn Knowledge Representation for the Semantic Web
- To learn Ontology Engineering
- To learn Semantic Web Applications, Services and Technology
- To learn Social Network Analysis and semantic web

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Ability to understand and knowledge representation for the semantic web.
CO2	Learn the various semantic web applications.
CO3	Ability to create ontology.
CO4	Ability to build a blogs and social networks.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	2	2	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2
CO4	3	2	3	2	-	-	-	-	-	-	-	3	3	2

UNIT I :

Thinking and Intelligent Web Applications, The Information Age, The World Wide Web, Limitations of Today Web, The Next Generation Web. Machine Intelligence, Artificial Intelligence, Ontology, Inference engines, Softwa

Agents, Berners-Lee www, Semantic Road Map, Logic on the semantic Web.

UNIT II:

Ontologies and their role in the semantic web, Ontologies Languages for the Semantic Web –Resource Descript Framework(RDF) / RDF Schema, Ontology Web Language(OWL),UML,XML/XML Schema. Ontology Engineeri Constructing Ontology, Ontology Development Tools, Ontology Methods, Ontology Sharing and Merging, Ontolo Libraries and Ontology Mapping.

UNIT III:

Logic, Rule and Inference Engines. Semantic Web applications and services, Semantic Search, e-learning, Seman Bioinformatics, Knowledge Base .

XML Based Web Services, Creating an OWL-S Ontology for Web Services, Semantic Search Technology, W Search Agents and Semantic Methods.

UNIT IV:

What is social Networks analysis, development of the social networks analysis, Electronic Sources for Netwo Analysis – Electronic Discussion networks.

Blogs and Online Communities, Web Based Networks. Building Semantic Web Applications with social netwo features

XT BOOKS:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley interscience,2008.
2. Social Networks and the Semantic Web, Peter Mika,Springer,2007

REFERENCE BOOKS:

1. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, Rudi Studer, Pa Warren, John Wiley & Sons.

2. Semantic Web and Semantic Web Services -Liyang Lu Chapman and Hall/CRC Publishers,(Taylor & Franc Group)

3. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.

4. Programming the Semantic W eb, T.Segaran, C.Evans, J.Taylor,O'Reilly, SPD.

RESOURCES:

1. https://www.semanticscholar.org/
2. https://info.sice.indiana.edu/

Course Code- CYBER FORENSICS

Lecture – Tutorial-Practical:: 3-0-0

Internal Marks: 40

Credits: 4

External Marks: 60

Prerequisites:

Network Security

Course Objectives:

- A brief explanation of the objective is to provide digital evidences which are obtained from digital media.
- In order to understand the objectives of computer forensics, first of all, people have to recognize the differe roles computer plays in a certain crime.
- According to a snippet from the United States Security Service, the functions computer has in different kin of crimes.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1	Students will understand the usage of computers in forensic
CO2	How to use various forensic tools for a wide variety of investigations
CO3	Understanding of the cyber security needs of an organization.
CO4	It gives an opportunity to students to continue their zeal in research in computer forensics

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2- Medium, 3 – High

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	1 (3
CO1	3	-	2	2	-	-	-	-	-	-	-	3	3	3	
CO2	3	2	3	2	-	-	-	-	-	-	-	-	3	2	
CO3	3	2	3	2	-	-	-	-	-	-	-	3	3	2	
CO4	3	-	3	2	-	-	-	-	-	-	-	-	3	2	

UNIT I :

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crim Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities Initial Response, Phase after detection of an incident

UNIT II:

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Init Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Foren Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forens Duplicate/Qualified Forensic Duplicate of a Hard Drive.

UNIT III:

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressi data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures network forensics, using network tools, examining the honeynet project.

UNIT IV:

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, comput forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-m in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violatior understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisitic procedures for cell phones and mobile devices.

TEXT BOOKS:

1. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

REFERENCE BOOKS:

1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education
2. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition

E-RESOURCES:

1. www.ComputerForensicsWorld.com – Prevention. Protection. Safety.
2. http://www.cyberforensics.in/
3. http://www.forensicfocus.com