1.2.1(3)

Certified List of Courses for 2020-21

NRIINSTITUTEOFTECHNOLOGY

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

1.2.1(3)-Certified List of New Courses along with the Highlighted Course Structure for the A.Y. 2020-21

NRIA18 1-13A1.2.1 2020-21

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

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III 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	18A3101401	Soil Mechanics	2	1	-	2	40	60	100	3
2	18A3101402	Reinforced Concrete Structures	2	1	-	3	40	60	100	3
3	18A3101403	Water Resource Engineering-I	2	-	-	2	40	60	100	2
4	18A3101404	Structural Analysis- II	2	1	-	3	40	60	100	3
5		**Professional Elective-1**	3	-	-	3	40	60	100	3
	18A3101511	Subsurface Investigation and Instrumentation								
	18A3101512	Advanced Concrete Technology								
	18A3101513	Environmental Pollution and Contro								
	18A3101514	Airport Planning and Design								
	18A3101515	Urban Hydrology								
6		**Open Elective –II**	3	-	-	3	40	60	100	3
	18A3101601	Building Material								
	18A3101602	Air pollution & control								
	18A3101603	Management Science								
7	18A3101491	Soil Mechanics Lab	-	-	3	3	40	60	100	1.5
8	18A3101492	Concrete Technology Lab	-	-	3	3	40	60	100	1.5
9	18A3100801	Constitution of India	2	-	-	2	40	60	100	0
		Total	**16**	**3**	**4**	**23**	**360**	**540**	**900**	**20**

III 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	18A3201401	Foundation Engineering	3	-	-	3	40	60	100	3
2	18A3201402	Highway engineering	3	-	-	3	40	60	100	3
3	18A3201403	Environmental Engineering	2	-	-	2	40	60	100	2
4		**Professional Elective -II**	3	-	-	3	40	60	100	3
	18A3201511	Ground Improvement Techniques								
	18A3201512	Water Resource Engineering-II								
	18A3201513	Air Pollution Engineering								
	18A3201514	Railway Engineering								
	18A3201515	Green buildings and sustainability								
5		**Professional Elective -III**	3	-	-	3	40	60	100	3
	18A3201521	Expansive Soils								
	18A3201522	Repair and Rehabilitation of Structures								
	18A3201523	Industrial Waste & Waste-Wate Engineering								
	18A3201524	Docks and Harbour Engineering								
	18A3201525	Water Resources System Analysis								
6		**Open Elective-III**	3	-	-	3	40	60	100	3
	18A3201601	Building Construction								
	18A3201602	Green Building								
7	18A3201491	Highway engineering Lab	-	-	3	3	40	60	100	1.5
8	18A3201391	Computer Aided Civil Engineering Drawing	-	-	3	3	40	60	100	1.5
9	18A3200801	Essence of Indian knowledge and traditions	2	-	-	2	40	60	100	0
		Total	**19**	**-**	**6**	**25**	**360**	**540**	**900**	**20**

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

18A3101401-SOIL MECHANICS

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

Prerequisites:

Course Objectives:

1. To enable the student to find out the index properties of the soil and classify it.
2. To enable the students to differentiate between compaction and consolidation of soils and to determine the consolidation settlement.
3. To enable the student to determine permeability of soils using various methods.
4. To impart the concept of seepage of water through soils and determine the seepage discharge.

Course Outcomes:

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

CO1 Identify various soils based on their characteristics.

CO2 Characterize and classify soils based on different limits.

CO3 Evaluate permeability and seepage of soils.

CO4 Determine the permeability of soils and stratified soils

CO5 Determine plasticity characteristics of various soils

CO6 Design consolidation process by predicting settlement of 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	2	1	-	2	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	1	-	-	-	-
CO3	2	1	-	-	-	1	-	-	-	-	-	-
CO4	2	2	-	-	-	1	-	-	-	-	-	-
CO5	2	2	-	-	-	1	-	-	-	-	-	-
CO6	2	2	2	-	-	1	-	1	-	-	-	-

UNIT I

Types and Characteristics of soils

Types of soils - formation and deposition - moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity. Relationship between various soil parameters. Determination of Moisture content, Specific gravity and Unit weight using various methods.

LO: 1. Understand the characteristics of soils

2. Assess relationships between different parameters

1. **Determine soil properties**

Plasticity Characteristics of Soil

Consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices. Determination of liquid limit, plastic limit and shrinkage limit. Soil classification based on particle size, texture, unified and Indian standard method.

LO: 1. Determination of Liquid, Shrinkage and Plasticity Limits

18A3101402-REINFORCED CONCRETE STRUCTURES

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

Prerequisites: Strength of Materials, Structural Analysis

Course Objectives:

1) To teach concepts of working stress and limit state methods.
2) To impart design procedure of RC elements in flexure, shear and torsion.
3) To teach design procedure for short and long RC columns.
4) To explain design procedure of RC footings
5) To demonstrate design of RC slab

Course Outcomes:

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

CO1 Work on different types of design philosophies
CO2 Carryout analysis and design of flexural members and detailing
CO3 Design of different types of slabs subjected to shear, bond and torsion
CO4 Design of dog legged stair case
CO5 Design different types of columns
CO6 Design different types of footings

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	-	-	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	-	-	-	-
CO6	3	3	3	-	-	2	-	2	-	-	-	-

UNIT I

Basic concepts of RCC and Design of Beams

Concepts of Reinforced concrete Design – Working Stress Method - Limit State method – Material Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS – 456 – 2000. Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections

LO: 1. Familiarize with working stress and limit stress method of design.
2. Understand stress block parameters in methods of analysis
3. Design of beams of varying cross sections adopting IS Code

UNIT II

Shear and torsion:

Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing;

LO: 1. Understand behaviour of beams under shear and torsion
2. Visualize importance of bond and anchorage
3. Design and Detail RC beams under due to shear and torsion adopting IS Code.

UNIT III

Design of one way slab, Two-way slabs and continuous slab using I.S.

Permeability of Soil

Darcy's law- coefficient of permeability: determination by constant-head and falling-head methods. Permeability of stratified soils - factors affecting - Seepage Analysis- stream and potential functions - flow nets, graphical method to plot flow nets.

LO: 1. Determine the permeability of soils and stratified soils.

2. Understand about the factors effecting permeability

3. Estimate and plot flow net

UNIT III

Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Capillary action, seepage pressure, quick sand condition. Compaction of Soil- theory of compaction- optimum moisture content- maximum dry density. Stresses in soils due to point load, line load, strip load, uniformly loaded circular, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart.

LO: 1. Compute stresses in soils under various loading conditions.

2. Understand compaction of soils

3. Calculate stresses in Soils under different loading conditions

UNIT IV

Consolidation of Soil - comparison between compaction and consolidation, initial, primary & secondary consolidation - Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

LO: 1. Understand the consolidations and settlement of soils.

2. Differentiate compaction and consolidation

3. Assessment of final settlements of soil

4. Differentiate primary and secondary consolidation

TEXT BOOKS:

1. K. R. Arora, Soil Mechanics and Foundation Engg., Standard Publishers and Distributors, Delhi.
2. C. Venkataramiah, Geotechnical Engineering, New age International Pvt . Ltd, (2002).

REFERENCE BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation, Laxmi publications Pvt. Ltd., New Delhi
2. Gopal Ranjan & A. S. R. Rao, Basic and Applied Soil Mechanics, New age International Pvt . Ltd, New Delhi.

E-RESOURCES:

- http://www.btechmaterials.com/download/geotechnical-engineering-gte-material-notes/
- http://www.nptelvideos.in/2012/11/soil-mechanics.html

18A3101403-WATER RESOURCE ENGINEERING-1

Lecture – Tutorial: 2-1 Hours **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: Hydraulics

Course Objectives:

- Introduce hydrologic cycle and its relevance to Civil engineering
- Make the students understand physical processes in hydrology and, components of the hydrologic cycle
- Appreciate concepts and theory of physical processes and interactions
- Learn measurement and estimation of the components hydrologic cycle.
- Provide an overview and understanding of Unit Hydrograph theory and its analysis
- Understand flood frequency analysis, design flood, flood routing
- Appreciate the concepts of groundwater movement and well hydraulics

Course Outcomes:

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

CO1 Develop design storms and carry out frequency analysis

CO2 Determine storage capacity and life of reservoirs.

CO3 Develop unit hydrograph and synthetic hydrograph

CO4 Estimate flood magnitude and carry out flood routing.

CO5 Determine aquifer parameters and yield of wells.

CO6 Model hydrologic 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	-	-	1	-	1	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	1	-	1	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	-	-	-	-	-	-	-

UNIT I

Engineering hydrology and Precipitation

Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. **Precipitation**: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

LO 1. Understand basics of engineering hydrology and its applications.

2. Demonstrate measurement techniques of precipitation.

3. Learn curves related to frequency of rainfall.

UNIT II

LO: 1. Classify understand performance of slabs based on dimensions
2. Design reinforced concrete slabs & Stair cases as per IS codal provisions.

UNIT IV

Short and Long columns – under axial loads, uniaxial bending and biaxial bending – I S Code provisions.

LO: 1. Understand behaviour of columns with different slenderness characteristics
2. Contrast behaviour of columns axial and under Uniaxial, Biaxial eccentricities
3. Design and detail RC columns under different loads adopting IS Code.

Footings:

Different types of footings – Design of isolated, square, rectangular, circular footings and combined footings.

LO: 1. Classify footings based on shape and utility
2. Examine the field conditions and suggest appropriate footings
3. Design reinforced concrete footings.

TEXT BOOKS:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Limit State Design, Laxmi, publications Pvt. Ltd., New Delhi
2. P. C. Varghese, Limit state designed of reinforced concrete, Prentice Hall of India, New Delhi

REFERENCE BOOKS:

1. N. Krishna Raju, Structural Design and Drawing, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
2. N. C. Sinha and S. K Roy, Fundamentals of reinforced concrete , S. Chand publishers

E-RESOURCES:

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

18A3101401 -STRUCTURAL ANALYSIS-II

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

Prerequisites: Strength of Materials, Structural Analysis-I

Course Objectives:

- Familiarize Students with Different types of Structures
- Equip student with concepts of Arches
- Understand Concepts of lateral Load analysis
- Familiarize Cables and Suspension Bridges
- Understand Analysis methods Moment Distribution, Kanis Method and Matrix Methods

Course Outcomes:

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

CO1 Analyze three Hinged Arches and two Hinged Arches
CO2 Analyze structures using Slope deflection method
CO3 Analyze structures using Moment Distribution method
CO4 Carryout lateral Load analysis of structures
CO5 Analyze structures using Flexibility Matrix method
CO6 Analyze structures using Stiffness Matrix method

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	3	-	-	-	2	-	1	-	-	-	-
CO4	3	3	-	-	-	2	-	1	-	-	-	-
CO5	3	3	-	-	-	2	-	1	-	-	-	-
CO6	3	3	-	-	-	2	-	1	-	-	-	-

UNIT I

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question).

UNIT II

Slope-Deflection: Analysis of single bay, single storey, portal frame including side sway.

LO. 1. Analyze 2D frames using slope-deflection method.

Moment Distribution Method: Introduction to moment distribution method- application to continuous beams with and without settlement of supports. Analysis of single storey portal frames – including Sway.

LO.1. Develop moment distribution expressions

2. Analyze structures with and without support sinking

3. Analyze single storey portal frames

UNIT III

Abstractions from Precipitation:
Initial abstractions. Evaporation: factors affecting, measurement, reduction Evapo transpiration: factors affecting, measurement, control - Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

LO 1. Attain knowledge on factors influencing evaporation.

2. Analyze factors influencing infiltration.

UNIT III

Runoff and Hydrograph analysis:
Catchment characteristics, Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

UNIT IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management. **Flood Routing:** Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

LO 1. Develop knowledge on floods and its effects.

2. Understand flood routing techniques.

TEXT BOOKS:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok
   Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

REFERENCE BOOKS:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd (2013), New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna
   Publishers

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html
- http://www.nptelvideos.in/2012/11/advanced-hydrology.html
- http://freevideolectures.com/Course/100/Water-Resources-Engineering
- http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/
- http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/

PROFESSIONAL ELECTIVE-1

18A3101511-SUBSURFACE INVESTIGATION AND INSTRUMENTATION

Lecture – 3-0 Hours **Internal Marks:** 40
Tutorial:
Credits: 3 **External Marks:** 60

Prerequisites: Soil Mechanics

Course Objectives:

1) To discuss the importance of site investigation,
2) To narrate various exploration techniques
3) To describe soil sampling techniques.
4) To train with in situ sub soil exploration methods
5) To demonstrate instrumentation for sub soil exploration.

Course Outcomes: Soil Mechanics

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

CO1 Plan and execute sub soil investigation programme.
CO2 Different exploration techniques
CO3 Handle both laboratory and in-situ testing techniques.
CO4 Carry out collection, handling and preservation of samples.
CO5 In situ exploration methods
CO6 Handle instruments during sub soil exploration 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	2	-	-	2	-	2	-	1	-	-	-	-
CO2	2	-	-	-	-	2	-	-	-	-	-	-
CO3	2	-	-	-	-	2	-	2	-	-	-	-
CO4	2	-	2	2	-	2	-	1	-	-	-	-
CO5	2	-	-	-	-	2	-	2	-	-	-	-
CO6	2	-	-	-	-	1	-	1	-	-	-	-

UNIT I

Exploration and geophysical methods:

Exploration program planning -methods of exploration- preliminary and detailed design- spacing and depth of bores, data presentation. Geophysical exploration and interpretation, seismic and electrical methods, cross bore hole, single bore hole – up hole -down hole methods.

LO: 1. Understand exploration process
2. Learn different methods of methods.

UNIT II

Exploration Techniques

Methods of boring and drilling, non-displacement and displacement methods, drilling in difficult subsoil conditions, limitations of various drilling techniques, stabilization of boreholes, bore logs.

LO: 1. Learn various exploration techniques.
2. Determine appropriate methods of exploration based on limitations

UNIT III

Soil Sampling

Sampling Techniques – quality of samples – factors influencing sample quality

UNIT IV

Matrix Methods:

Flexibility method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements. Analysis of single bay, single storey portal frame including sway.

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements. Analysis of single bay, single storey portal frame including sway.

TEXT BOOKS:

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2. Structural Analysis, R.C. Hibbeler, Pearson Education, India
3. Theory of Structures – II, B. C. Punmia, Jain & Jain, Laxmi Publications, India.

REFERENCE BOOKS:

1. Intermediate Structural Analysis, C. K. Wang, Tata McGraw Hill, India
2. Theory of structures, Ramamuratam, Dhanpatrai Publications.
3. Analysis of structures, Vazrani & Ratwani – Khanna Publications.

E-RESOURCES:

- http://www.btechmaterials.com/download/structural-analysis-materials-notes/
- http://www.nptelvideos.in/2012/11/structural-analysis-i.html

PROFESSIONAL ELECTIVE-1
18A3101512-ADVANCED CONCRETE TECHNOLOGY

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Building materials and Construction

Course Objectives:

To learn the concepts of Concrete production and its behaviour in various environments.

To learn the test procedures for the determination of properties of concrete.

To understand durability properties of concrete in various environments

Course Outcomes:

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

CO1 Understand the basic concepts of concrete.

CO2 Realise the importance of quality of concrete.

CO3 Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.

CO4 Fresh concrete properties and the hardened concrete properties.

CO5 Familiarise the basic concepts of special concrete and their production and applications.

CO6 Understand the behaviour of concrete in various environments.

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	-	-	2	-	2	-	1	-	-	-	-
CO4	2	-	-	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	1	-	-	-	-
CO6	2	-	-	-	-	-	-	1	-	-	-	-

UNIT I

Concrete Making Materials : Cement – Bogus Compounds – Hydration Process – Types of Cement – Aggregates – Gradation Charts – Combined Aggregate – Alakali Silica Reaction –Admixtures – Chemical and Mineral Admixtures. Bureau of Indian Standards (BIS) Provisions.

UNIT II

Fresh And Hardened Concrete: Fresh Concrete – workability tests on Concrete – Setting Times of Fresh Concrete – Segregation and bleeding. Hardened Concrete : Abrams Law, Gel space ratios, Maturity concept – Stress strain Behaviour – Creep and Shrinkage – Durability Tests on Concrete – Non Destructive Testing of Concrete. BIS Provisions.

UNIT III

High Strength Concrete – Microstructure – Manufacturing and Properties – Design of HSC Using Erintroy Shaklok method – Ultra High Strength Concrete. High Performance Concrete – Requirements and Properties of High Performance Concrete – Design Considerations. BIS Provisions.

samples.

LO: 1. Understand concepts of sampling

2. Study different types of sampling techniques.

UNIT IV

Field Testing In Soil Exploration

Field tests, penetration tests, Field vane shear, Insitu shear and bore hole shear test, pressure meter test, dilatometer test - plate load test–monotonic and cyclic; field permeability tests – block vibration test. Procedure, limitations, correction and data interpretation.

LO: 1. Develop insitu soil exploration methods.

2. Interpret data of soil exploration and documentation

Instrumentation

Instrumentation in soil engineering, strain gauges, resistance and inductance type, load cells, earth pressure cells, settlement and heave gauges, pore pressure measurements - slope indicators, sensing units, case studies.

LO: 1. Choose appropriate instrumentation in sub soil exploration process

TEXT BOOKS:

1. Alam Singh and Chowdhary G. R., "Soil Engineering in Theory and Practice, Volume-2, Geotechnical testing and instrumentation, CBS Publishers and Distributors, New Delhi, 2006.

2. Dunnicliff J., and Green, G. E., "Geotechnical Instrumentation for Monitoring Field Performance", John Wiley, 1993.

REFERENCE BOOKS:

1. Bowles J. E., "Foundation Analysis and Design", 5th Edition, The McGraw-Hill companies, Inc., New York, 1995.
2. Hanna T. H., "Field Instrumentation in Geotechnical Engineering", Trans Tech., 1985.

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/foundation-engineering.html
- http://www.btechmaterials.com/download/foundation-engineering-fe-material-notes/

INPLANT CONTROL MEASURES Process Change-Dry and Wet Methods of Removal and Recycling-Dust Collection Devices-Internal Separators-Catalyst Reduction

AIR POLLUTION CONTROL BY DILUTION General-Meteorological Factors-Atmospheric Temperature Lapse Rate-Speed and Direction of Wind- Wind Velocity Profile-Diffusion Theories-Objects of Stack

TEXT BOOKS:

1 Air Pollution and Control by Rao, M.N and Rao, H.N., Tata McGraw Hill, New Delhi, 2007.

2. Environmental Engineering and Management, (2nd Edition) by Suresh, S.K.Kartarai & Sons, 2005.

REFERENCE BOOKS:

1. An Introduction to Air pollution by Trivedy, R.K., B.S.Publications, 2005.

2. Air pollution by Wark and Warner, Addison-Wesley Publications, 1998.

E-RESOURCES:

NPTEL

PROFESSIONAL ELECTIVE-1

18A3101513-ENVIRONMENTAL POLLUTION AND CONTROL

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Environmental Studies

Course Objectives:

1) **Impart knowledge on aspects of air pollution & control and noise pollution**
2) **Impart concepts of treatment of waste water from industrial source.**
3) **Differentiate the solid and hazardous waste based on characterization**
4) **Introduce sanitation methods essential for protection of community health.**
5) **Provide basic knowledge on sustainable development.**

Course Outcomes:

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

CO1 Identify the air pollutant control devices

CO2 Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.

CO3 Identify the air pollutant control devices and have knowledge on the NAAQ standards and air emission standards.

CO4 Differentiate the treatment techniques used for sewage and industrial wastewater treatment.

CO5 Inventing the methods of environmental sanitation and the management of community facilities without spread of epidemics.

CO6 Appreciate the importance of sustainable development while planning a project or executing an activity.

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	1	-	-	-	-
CO2	2	-	-	-	-	-	2	1	-	-	-	-
CO3	2	-	-	-	-	-	2	1	-	-	-	-
CO4	2	-	-	-	-	-	2	1	-	-	-	-
CO5	2	-	-	-	2	-	2	1	-	-	-	-
CO6	2	2	-	-	-	-	2	1	-	-	-	-

UNIT I

Air Pollution:

Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards. Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

LO: 1. Understand control mechanism of air pollutants

Reinforced Concrete – Reactive Powder Concrete – Requirements and Guidelines – Advantages and Applications. Concrete Mix Design: Quality Control – Quality Assurance – Quality Audit - Mix Design Method – BIS Method – IS.10262 – 2019 Concrete Mix proportion guidelines. DOE Method– Light Weight Concrete, Self Compacting Concrete.

Form work – materials – structural requests – form work systems – connections – specifications – design of form work – shores – removal for forms - shores – reshoring – failure of form work.

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:

- https://onlinecourses.nptel.ac.in/noc16_ce10/preview
- http://nptel.ac.in/courses/105104030/http://freevideolectures.com/Course/3357/Concrete-Technology
- http://textofvideo.nptel.iitm.ac.in/105102012/lec1.pdf

PROFESSIONAL ELECTIVE-1
18A3101514-AIRPORT PLANNING AND DESIGN

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: ----

Course Objectives:

1) Introduction to the growth of air transport and aircraft characteristics.
2) Competence in building the background in Airport engineering and understanding its features with a technical sense.
3) Synthesis in incorporating the planning and design of airport.
4) Required Development of the theoretical basis of subject and to design the various airport components.
5) Better Comprehension of various probable alternatives to design airport components

Course Outcomes:

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

CO1 **Obtain a basic Knowledge of the fundamental issues in Airport engineering.**

CO2 **Demonstrate the clear understanding of the airport components.**

CO3 **Learn principles in airport components geometric**

CO4 **Learn the airport components capacity and delays**

CO5 **Learn critical factors consideration in airport design**

CO6 **Design and be able to apply these principles in field**

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	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	3	-	-	2	-	2	-	-	-	-

UNIT I

Growth and Characteristics of Airport and Aircraft:

Growth of air transport, airport organization and associations, Classifications of airports airfield components, airport traffic zones and approach areas. Aircraft Components, size turning radius, speed, airport characteristics.

LO: 1. Understanding planning aspects of airports

2. Understand aircraft components and deciding dimensions

UNIT II

Airport Engineering:

Airport site selection – factors affecting site selection and surveys- runway orientation – wind rose diagram – basic runway length – correction for runway length – terminal area – layout and functions – concepts of terminal

Industrial waste water Management:

Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

LO: 1. Understand the importance of treatment process of industrial effluents.

2. Design treatment plants

UNIT III

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration-Composting-Solid waste disposal methods – fundamentals of Land filling. Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

LO: 1. Classification of solid waste and separation and procession solid waste

2. Identification of Hazardous wastes

3. Plan and execute solid waste and hazardous waste management.

UNIT IV

Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

LO: 1. Understand importance of hygienic environment

2. Suggest appropriate rural sanitation methods to keep surrounding clean.

TEXT BOOKS:

1. **Peavy, H. S., Rowe, D.R, Tchobanoglous, Environmental Engineering, G.Mc-Graw Hill International Editions, New York 1985.**
2. **J. G. Henry and G.W. Heinke, Environmental Science and Engineering, Pearson Education.**

REFERENCE BOOKS:

1. **G. L. Karia and R.A. Christian, Waste water treatment- concepts and design approach, Prentice Hall of India**
2. **Ruth F. Weiner and Robin Matthews Environmental Engineering, 4th Edition Elesevier, 2003**

E-RESOURCES:

http://www.nptelvideos.in/2012/11/environmental-air-pollution.html

PROFESSIONAL ELECTIVE-1
18A3101515-URBAN HYDROLOGY

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1) To impart impact of urbanization on catchment hydrology.
2) Narrate the importance of rainfall runoff data for urban hydrology.
3) Teach techniques for peak flow estimation for storm water drainage system design.
4) Explain the design concepts of components in urban drainage systems.
5) Train for preparation of master urban drainage system.

Course Outcomes:

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

CO1 Impact of urbanization on catchment hydrology

CO2 Develop intensity duration frequency curves for urban drainage systems.

CO3 Peak flow estimations

CO4 Develop design storms to size the various components of drainage systems.

CO5 Apply best management practices to manage urban flooding.

CO6 Develop master drainage plan for an urbanized area.

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	3	-	-	2	-	1	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	2	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	2	3	-	-	2	-	1	-	-	-	-

UNIT I

Urbanization and Precipitation Analysis

Urbanization and its effect on water cycle – urban hydrologic cycle – Effect of urbanization on hydrology. **Precipitation Analysis**: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration and design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

LO: 1. Define Urbanization and its effects

2. Understand basic concepts of hydrological cycle.

UNIT II

Methods of Urban Drainage:

Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse , major and minor systems. Drainage systems: Open

2. Identify features of terminal building layout

civiUNIT III

Capacity and Delay, Airport planning, surveys and Design:

Factors affecting capacity, Determination of runway capacity related to delay, gate capacity, and Taxiway capacity Airport Site Selection, Runway length and width, sight distances, longitudinal and transverse grades, runway intersections, taxiways, clearances, aprons, numbering, holding apron, noise control, Problems.

LO: 1. Classification of taxiway and features

2. Design of airport component for handling operations on land

UNIT IV

Planning and Design of the Terminal area:

Design of drainage systems, construction methods, layout of surface drainage and subsurface drainage system, Problems. Runways and taxiways markings, day and night landing aids, airport lighting, ILS and other associated aids.

LO: 1. Develop knowledge on grading and planning of airport layout.

2. Understand Airport landing systems

Geometric design of runways

Aircraft characteristics – influence of characteristics on airport planning and design – geometric design elements of runway – runway lighting.

LO: 1. Design of runways

TEXT BOOKS:

1. **Khanna, Arora and Jain, Airport Planning and Design, Nem Chand and Bros., Roorkee**
2. **Rangwala, Airport Engineering – Charotar Publisher**

REFERENCE BOOKS:

1. **R. Srinivasa Kumar, Transportation Engineering: Railways, Airports, Docks and Harbors, Universities Press Pvt Ltd, Hyderabad. 2014.**
2. **Virender Kumar and Satish Chandra, Airport Planning and Design, Galgotia Publication press.**

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

Open Elective-2 (Offered by Department of civil engineering)

18A3101601-BUILDING MATERIALS

Lecture – Tutorial: 2-0 Hours **Internal Marks:** 40
Credits: 2 **External Marks:** 60
Prerequisites: Engineering chemistry, engineering geology and physics

Course Objectives:

- To learn the availability, types, uses and various tests for building materials.
- To know about activities in building construction.

Course Outcomes:

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

CO1 Understand the process of making quality stones with its applications.
CO2 Understand the process of making quality bricks with its applications.
CO3 Assess quality of lime in a detailed manner on the usage in the present-day construction.
CO4 Assess quality of timber in a detailed manner on the usage in the present-day construction.
CO5 Assess quality of steel in a detailed manner on the usage in the present-day construction.
CO6 Acquire the knowledge about paints, varnishes, distempers

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	-	1	-	-	-	-
CO3	2	2	-	-	-	1	-	1	-	-	-	-
CO4	3	-	-	-	-	1	-	2	-	-	-	-
CO5	2	2	-	-	-	-	-	1	-	-	-	-
CO6	3	1	-	-	-	1	-	2	-	-	-	-

UNIT I

STONES Qualities of a good building stone; Stone quarrying; Tools for blasting; Materials for blasting; Process of blasting; Precautions in blasting; Dressing of stones; Common building stones of India.

BRICKS General; Composition of good brick earth; Harmful ingredients in brick earth; Classification of brick earth; Manufacture of bricks; Comparison between clamp burning and kiln burning; Qualities of good bricks; Tests for bricks; Classification of bricks; Substitutes for bricks

UNIT II

LIME General, Some definitions, sources of lime, constituents of lime stones, classification of limes, comparison between fat lime and hydraulic lime , manufacture of fat lime

TIMBER Definition; Classification of trees; Structure of a tree; Felling of trees; Defects in timber; Qualities of good timber; Decay of timber; Preservation of timber; Fire resistance of timber; Seasoning of timber; Market forms of timber; Industrial timber; Advantages of timber construction; Use of timber; Indian timber trees.

UNIT III

STEEL General; Manufacture of steel; Uses of steel; Factors affecting physical properties; Defects in steel; Market forms of steel; Properties of mild steel; Properties of hard steel; Corrosion of ferrous metals.

UNIT IV

UNIT III

Analysis and Management:

Storm water drainage structures, design of storm water network- Best Management Practices–detention and retention facilities, swales, constructed wetlands, models available for storm water management.

LO: 1. Design drainage network scheme.

UNIT IV

Drainage plans:

Issues – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, and use of models in planning.

LO: 1. Prepare proper plan for storm water drainage system

TEXT BOOKS:

1. Akan A.O and R.L. Houghtalen, Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling (2006), Wiley International.
2. Hall M. J., Urban Hydrology (1984), Elsevier Applied Science Publisher.

REFERENCE BOOKS:

1. Geiger W. F., J Marsalek, W. J. Rawls and F. C. Zuidema, Manual on Drainage in Urbanised area' (1987 – 2 volumes), UNESCO,
2. Wanielista M. P. and Eaglin, Hydrology – Quantity and Quality Analysis (1997), Wiley and Sons.

E-RESOURCES:

Open Elective-2 (Offered by Department of civil engineering)

18A3101602-AIR POLLUTION & ITS CONTROL

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

Course Objectives:

- To identify the pollutants and their sources and then the transport mechanisms of the pollutants followed by the affected population and respective controls.
- To learn the techniques and instrumentation of ambient air monitoring,
- Establishment of ambient air monitoring stations, stacks monitoring.
- To know the methods of analysis air and air pollutants.

Course Outcomes:

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

CO1 Understand of contemporary pollution issues.
CO2 Analyze specific examples of various sources of air pollution.
CO3 Understand the properties of atmosphere
CO4 Comprehend the causes of key types of air pollution.
CO5 Comprehend the effects of key types of air pollution
CO6 Classify of different pollution control strategies

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	2	-	-	-	1	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	2	-	1	-	-	-	-

UNIT I

AIR POLLUTION Air pollution - definitions-scope, significance - air pollutants - measurements of pollution classification –natural and artificial-primary and secondary, point and non-point.

EFFECT OF AIR POLLUTION Effect of air pollutants on man-material and vegetation-global effects of air pollution green house effect, heat lands, acid rains and ozone.

UNIT II

METEROLOGY AND PLUME DISPERSION Properties of atmosphere-heat, pressure, wind forces, moisture and relative humidity influence of meteorological phenomenon on air quality- wind rose diagram.

UNIT III

METHODS OF CONTROLLING Control of particulates-control at sources-controlling equipments-settling chamber centrifugal separators-fabric filters –dry and wet scrubbers-electrostatic precipitators.

UNIT IV

TEXT BOOKS:

1. Engineering Materials, (36th edition) by Rangwala, S.C., Anand Charotar Publishing House, 2009.
2. Building construction, (10th edition) by Punmia, B. C., Laxmi Publications, Bangalore, 2009.

REFERENCE BOOKS:

1. Building construction and construction materials by Birdie, G.S. and Ahuja, T.D., Dhanpath Rai Publishing company, New Delhi, 1986.

E-RESOURCES:

- http://nptel.ac.in/courses.php
- http://jntuk-coeerd.in/

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

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III 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	18A3101401	Soil Mechanics	2	1	-	2	40	60	100	3
2	18A3101402	Reinforced Concrete Structures	2	1	-	3	40	60	100	3
3	18A3101403	Water Resource Engineering-I	2	-	-	2	40	60	100	2
4	18A3101404	Structural Analysis- II	2	1	-	3	40	60	100	3
5		**Professional Elective-I**	3	-	-	3	40	60	100	3
	18A3101511	Subsurface Investigation and Instrumentation								
	18A3101512	Advanced Concrete Technology								
	18A3101513	Environmental Pollution and Control								
	18A3101514	Airport Planning and Design								
	18A3101515	Urban Hydrology								
6		**Open Elective –II**	3	-	-	3	40	60	100	3
	18A3101601	Building Material								
	18A3101602	Air pollution & control								
	18A3101603	Management Science								
7	18A3101491	Soil Mechanics Lab	-	-	3	3	40	60	100	1.5
8	18A3101492	Concrete Technology Lab	-	-	3	3	40	60	100	1.5
9	18A3100801	Constitution of India	2	-	-	2	40	60	100	0
		Total	16	3	6	25	360	540	900	20

III 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	18A3201401	Foundation Engineering	3	-	-	3	40	60	100	3
2	18A3201402	Highway engineering	3	-	-	3	40	60	100	3
3	18A3201403	Environmental Engineering	2	-	-	2	40	60	100	2
4		**Professional Elective -II**	3	-	-	3	40	60	100	3
	18A3201511	Ground Improvement Techniques								
	18A3201512	Water Resource Engineering-II								
	18A3201513	Air Pollution Engineering								
	18A3201514	Railway Engineering								
	18A3201515	Green buildings and sustainability								
5		**Professional Elective -III**	3	-	-	3	40	60	100	3
	18A3201521	Expansive Soils								
	18A3201522	Repair and Rehabilitation of Structures								
	18A3201523	Industrial Waste & Waste-Wate Engineering								
	18A3201524	Docks and Harbour Engineering								
	18A3201525	Water Resources System Analysis								
6		**Open Elective-III**	3	-	-	3	40	60	100	3
	18A3201601	Building Construction								
	18A3201602	Green Building								
7	18A3201491	Highway engineering Lab	-	-	3	3	40	60	100	1.5
8	18A3201391	Computer Aided Civil Engineering Drawing	-	-	3	3	40	60	100	1.5
9	18A3200801	Essence of Indian knowledge and traditions	2	-	-	2	40	60	100	0
		Total	19	-	6	25	360	540	900	20

18A3201401-FOUNDATION ENGINEERING

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

Course Objectives:

1) To impart knowledge on soil exploration.
2) To teach slope stability and safety assessment of earth retaining structures.
3) To impart knowledge on bearing capacity and settlement of shallow foundations.
4) To throw light on pile and well foundation designs.

Course Outcomes:

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

CO1 Understand the methods of soil exploration.
CO2 Compile soil investigation report
CO3 Assess stability of slopes and earth retaining structures
CO4 Determine safe bearing capacity and settlement of shallow foundations.
CO5 Design pile foundations.
CO6 Design well foundations.

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	-	-	-	2	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-
CO5	2	3	3	-	-	2	-	1	-	-	-	-
CO6	2	3	3	-	-	2	-	1	-	-	-	-

UNIT I

Soil Exploration:

Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Pressure meter – Programme planning and preparation of soil investigation report.

LO: 1. Identify importance of soil exploration
2. Distinguish different soil exploration methods
3. Compile soil investigation report

Earth Retaining Structures:

Infinite and finite earth slopes in sand and clay – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices – Taylor's Stability Number-Stability of slopes of dams and embankments - different conditions. Rankine's & Coulomb's theory of earth pressure Culmann's graphical method - earth pressures in layered soils.

LO: 1. Understand different types of failures
2. Explain different types of stability analysis
3. Estimation of earth pressure in different types of soils and conditions
4. Design of earth retaining structures according to stability concepts.

UNIT II

Shallow Foundations:

Types of foundations and influencing factors - Bearing capacity – determination of bearing capacity – factors influencing bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory – settlements – Design aspects of shallow foundations-IS Methods.

LO: 1. Understand the different types of foundations

2. Determine the bearing capacity of soils.

3. Interpret settlements under different conditions

UNIT III

Pile Foundations:

Types of piles – Load carrying capacity based on static and Dynamic formulae– Pile load tests - pile groups in sands and clays- pile cap design.

LO: 1. Classify different types of piles

2. Assess load bearing capacity of different types of piles

3. Demonstrate pile load tests and to assess strength of pile

4. Understand functioning of different combinations of pile in groups

5. Design piles and pile caps in different soils.

UNIT IV

Well Foundations:

Types – Different shapes – Components of well foundation – forces acting on well foundations - Design Criteria – Determination of staining thickness and plug - construction and Sinking of wells – Tilt and shift.

LO: 1. Classify different types of wells based on shape

2. Assess loads acting on well foundations

3. Understand procedures like well sinking and tilts and shifts

TEXT BOOKS:

1. C. Venkataramiah, Geotechnical Engineering, New age International Pvt . Ltd, (2002)
2. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Soil Mechanics and Foundation by, Laxmi, publications Pvt. Ltd., New Delhi

REFERENCE BOOKS:

1. T. N. Ramamurthy, A Textbook Of Geotechnical Engineering (Soil Mechanics), S. Chand and Company Limited, New Delhi
2. Purushtoma Raj, Soil Mechanics and Foundation Engineering, Pearson Publications

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/foundation-engineering.html
- http://www.btechmaterials.com/download/foundation-engineering-fe-material-notes/

18A3201402-HIGHWAY ENGINEERING

Lecture –	3-0 Hours	**Internal Marks:**	40
Tutorial:			
Credits:	3	**External Marks:**	60

Prerequisites: -------

Course Objectives:

1) To impart knowledge on highway development and materials.
2) To teach concepts of Geometric design and alignment.
3) To throw light on traffic volume studies and regulation.
4) To teach design of highway intersections
5) To impart knowledge on design of pavements

Course Outcomes:

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

CO1 Carry out highway surveying and planning.
CO2 Understand characteristics of highway materials.
CO3 Geometric design and alignment
CO4 Design components of highway.
CO5 Design highway intersections.
CO6 Design highway 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

UNIT -I

Highway development and planning:

Highway development in India – Necessity for Highway Planning- Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment and influencing Factors - Engineering Surveys – highway materials and testing.

LO: 1. Understand importance of highway development

2. Classify highways based in field conditions and alignment

3. Carryout highway materials and testing

Basic Concepts of Geometric Design

Geometric Design- Design Criteria- Cross Section Elements

UNIT II

Highway geometric design:

Sight Distance - 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.

LO: 1. Understand different aspects govern highway design

2. Design highway features like alignment and super elevation

3. Design vertical and horizontal alignment of highways

UNIT III

Traffic engineering and regulation:

Basic Parameters - Traffic Volume Studies- Data Collection and Presentation- speed studies- Data Collection and Presentation- Parking Studies and characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams- Road Traffic Signs – Road markings- Design of Traffic Signals –Webster Method –Saturation flow – phasing and timing diagrams.

LO: 1. Identify need and basic parameters of traffic channelling

2. Understand traffic volume and regulation.

3. Visualize causes for road accidents

4. Design safety features traffic using different methodologies

Intersection design:

Conflicts at Intersections- Channelization –Traffic Islands and Design - Types of Intersections – Rotary Intersection and Design.

LO: 1. Study causes for conflicts at intersections

2. Plan types and positioning of traffic intersections on highway.

UNIT IV

Pavement design:

Flexible and rigid pavements – Components and Functions – design of Flexible pavement (G.I method and CBR Method as per IRC 37-2018 –Design of Rigid pavements – Westergaard's stress equations – CC pavements - Design of Expansion and contraction joints - Design of Dowel bars and Tie bars.

LO: 1. Distinguish flexible and rigid pavements

2. Design of pavements using different methods

3. Study expansion and contraction joints and their importance

TEXT BOOKS:

1. S. K. Khanna and C. E. G. Justo, Highway Engineering, Nemchand & Bros., 7th edition (2000).
2. R. Srinivasa Kumar, Text Book of Highway Engineering, Universities Press Pvt Ltd, Hyderabad. 2011.

REFERENCE BOOKS:

1. S K Sharma, A Textbook Of Highway Engineering, S. Chand and Company Limited, New Delhi
2. L. R. Kadiyali and Lal, Principles and Practice of Highway Engineering Design, Khanna Publications.

E-RESOURCES:

- http://www.btechmaterials.com/download/transportation-engineering-materials-notes/
- http://www.nptelvideos.in/2012/11/introduction-to-transportation.html
- https://www.allintuworld.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

18A3201403- ENVIRONMENTAL ENGINEERING

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Environmental Studies

Course Objectives:

1) To teach requirements of water and its treatment.
2) To impart knowledge on sewage treatment methodologies.
3) To provide facts on Air pollution and control.
4) To enable with design concepts of wastewater treatment units
5) To throw light on importance of plumbing.

Course Outcomes:

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

CO1 Understand about quality of water and purification process
CO2 Select appropriate technique for treatment of waste water.
CO3 Assess the impact of air pollution
CO4 Understand consequences of solid waste and its management.
CO5 Design domestic plumbing systems.
CO6 Selection of suitable treatment flow for raw water treatments.

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

Estimation of quality and quantity of water- Importance and Necessity of Protected Water Supply systems; Routine water analysis - physical, chemical and bacteriological tests; Standards for drinking water; Water borne diseases, Sources of Water: Surface and Ground water, comparison of sources with reference to quality, quantity and other considerations

Flow chart of public water supply system, Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations factors affecting water demand, Design Period Population Forecasting. - Capacity of storage reservoirs, Mass curve analysis.

LO: 1 Teach causes for water borne diseases.
2. Estimation of water demand for a colony /town/city.
3. Able to identify the sources of water.

UNIT II

Treatment of Water and distribution: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration-Slow sand and rapid sand filters; Construction and Operation; Disinfection methods-chlorination; Removal of hardness.
Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks.

LO: 1. Enlightens the efforts involved in converting raw water into clean potable water.
2. Able to apply treatment methods
3. Impart knowledge on water distribution network

UNIT III

Estimation of quantity and quality of sewage - Estimation of sewage flow and storm water drainage – fluctuations- classification of sewerage systems – types of sewers - Hydraulics of sewers and storm drains– design diameter of sewers – appurtenances in sewerage – Man holes, Street Inlets

Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination- Measurement of BOD and COD - BOD equations.

LO: 1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
2. Summarize the appurtenance in sewerage systems and their necessity
3. Provide knowledge of characterization of wastewater generated in a community.

UNIT IV

Treatment of sewage and disposal: Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units. Design of septic tank
Secondary treatment: Aerobic and anaerobic treatment process comparison. Suspended growth process: Activated Sludge Process, principles, and operational problems. Activated Sludge Processes. Attached Growth Process: Trickling Filters– mechanism of impurities removal- classification–operation and maintenance problems. Methods of disposal – disposal into water bodies-Oxygen Sag Curve-Disposal into sea, disposal on land- sewage sickness

LO: 1 Impart understanding of treatment of sewage and the need for its treatment.
2. Teach planning, and design of septic tank.
3. Effluent disposal method and realize the importance of regulations in the disposal of effluents in Rivers.

TEXT BOOKS:

1. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.
2. Environmental Engineering water supply Engineering- vol. 1 Santosh kumar Garg ,Khanna Publishers 2018 edition
3. Sewage waste disposal and Air pollution Engineering Santosh kumar Garg ,Khanna Publishers 2018 edition

REFERENCE BOOKS:

1. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, -2011 edition.
2. Wastewater engineering treatment and reuse - Metcliff & Eddy MCGraw Hill Education (India) private Limited- 2003 edition

E-RESOURCES:

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

PROFESSIONAL ELECTIVE-II

18A3201511-GROUND IMPROVEMENT TECHNIQUES

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Soil Mechanics and Foundation Engineering

Course Objectives:

1) To understand need for different ground improvement methods adopted for improving the properties of remoulded and in-situ soils by adopting different techniques
2) To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3) To know geo-textiles and geo-synthetics can to improve the performance of soils.
4) To learn the concepts, purpose and effects of grouting.

Course Outcomes:

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

CO1 Perceive the knowledge of various methods of ground improvement and their suitability to different field situations.
CO2 Design a reinforced earth embankment and check its stability.
CO3 Understand the functions of Geo-synthetics and their applications in Civil Engineering practice.
CO4 Understand the concepts and applications of grouting.
CO5 Concept of dewatering
CO6 Stabilization of 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	2	-	-	-	-	1	-	1	-	-	-	-
CO2	2	-	-	-	-	1	-	1	-	-	-	-
CO3	2	-	-	-	-	1	-	1	-	-	-	-
CO4	2	-	-	-	-	1	-	1	-	-	-	-
CO5	2					1		1				
CO6	2	-	-	-	-	1	-	1	-	-	-	-

UNIT I

UNIT- I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

***LO:* 1. Understand methods of insitu densification**

2. Study different types of drains for soil densification

Dewatering sumps and interceptor ditches single and multi stage well points – vacuum well points – horizontal wells – criteria for choice of filler material around drains – electro osmosis

***LO:* 1. Understand methods of dewatering**

2. Study different types of dewatering and working criteria

UNIT II

UNIT- II

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization – use of industrial wastes like fly ash and granulated blast furnace slag.

LO: 1. Study different methods of stabilization of soils

2. Study utilization of industrial wastes to stabilize soils

UNIT III

Reinforced earth – Principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing

LO: 1. Understand principles of reinforced earth in ground improvement

2. Study procedures for verification of stability of slopes

Geosynthetics – Geotextiles – types – functions, properties and applications – Geogrids, Geomembranes and gabions - properties and applications.

LO: 1. Utilization of advanced materials for ground improvement

2. Compare different types of synthetic based soil stabilization material and understand performance

UNIT IV

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting – hydraulic fracturing in soils and rocks – post grout tests

LO: 1. Understand methods of grouting

2. Assess efficiency of grouting adopting different tests

TEXT BOOKS:

1. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi.

2. Nihar Ranjan Patro, Ground Improvement Techniques, Vikas Publishing House (p) Limited, New Delhi.

REFERENCE BOOKS:

1. M. P. Moseley, Ground Improvement, Blackie Academic and Professional, USA.

2. R. M. Koerner, Designing with Geosynethetics, Prentice Hall.

E-RESOURCES:

- http://www.btechmaterials.com/download/ground-improvement-techniques-git-material-notes/
- http://www.btechmaterials.com/download/ground-improvement-techniques-git-material-notes/

PROFESSIONAL ELECTIVE-II

18A3201512-WATER RESOURCE ENGINEERING-II

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: Hydraulics, Water resource engineering-I

Course Objectives:

1) To discuss the importance of site investigation,
2) To narrate various exploration techniques
3) To describe soil sampling techniques.
4) To train with insitu sub soil exploration methods
5) To demonstrate instrumentation for sub soil exploration.

Course Outcomes:

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

CO1 Estimate irrigation water requirements

CO2 Design irrigation canals and canal network

CO3 Design irrigation canal structures

CO4 Plan and design diversion head works

CO5 Analyse stability of gravity and earth dams

CO6 Design ogee spillways and energy dissipation 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	2	-	-	-	2	-	1	-	-	-	-
CO2	2	3	3	-	-	2	-	1	-	-	-	-
CO3	2	3	3	-	-	2	-	1	-	-	-	-
CO4	2	3	3	-	-	2	-	1	-	-	-	-
CO5	2	2	-	-	-	2	-	1	-	-	-	-
CO6	2	3	3	-	-	2	-	1	-	-	-	-

UNIT I

Irrigation: Necessity and importance, principal crops and crop seasons, types,methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible

Canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles

UNIT III

Cross Drainage Works: Types, selection, design principles of aqueduct siphon aqueduct and super passage. **Outlets:** types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

Diversion Head Works: Types of diversion head works, weirs and barrages, Layout of diversion head works, components. causes and failures of weirs on permeable

foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for

Subsurface flow, exit gradient.

UNIT IV

Reservoir Planning: Investigations, site selection, zones of storage, yield and

Storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on gravity dam, causes of failure of a gravity dam,

Elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures

For control of seepage-filters, stability analysis-stability of downstream slope during steady seepage and upstream slope during sudden drawdown conditions.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

TEXT BOOKS:

1. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok

Kumar Jain, Arun Kumar Jain, Lakshmi Publications (P) Ltd.

2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna

Publishers.

REFERENCE BOOKS:

1. Irrigation and Water Resources Engineering, Asawa G L (2013), New Age International Publishers

2. Irrigation Water Resources and Water Power Engineering, Modi P N (2011), Standard Book House, New Delhi

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html
- http://www.nptelvideos.in/2012/11/advanced-hydrology.html
- http://freevideolectures.com/Course/100/Water-Resources-Engineering
- http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/
- http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/

PROFESSIONAL ELECTIVE-II

18A3201513-AIR POLLUTION ENGINEERING

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: -------

Course Objectives:

1) To teach the basics of air pollution
2) To impart the behaviour of air due to metrological influence
3) To throw light on air quality management
4) To teach the design of air pollution control methods

Course Outcomes:

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

CO1 Evaluating the ambient air quality based on the analysis of air pollutants

CO2 Design particulate and gaseous control measures for an industry

CO3 Judge the plume behaviour in a prevailing environmental condition

CO4 Estimate carbon credits for various day to day activities

CO5 Pollution control methods

CO6 Properties of atmosphere

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	-	-	-	-	-	-	-	-	-	-
CO2	2	3	3	-	-	1	-	1	-	-	-	-
CO3	2											
CO4	2	2	-	-	-	1	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Air Pollution:

Sampling and analysis of air pollutants, conversion of ppm into $\mu g/m^3$. Definition of terms related to air pollution and control - secondary pollutants - Indoor air pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

LO: 1. Learn the basics of air pollutants.

2. Estimate the impact of air pollution

UNIT II

Thermodynamics and Kinetics of Air-pollution:

Applications in the removal of gases like SOx, NOx, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

LO: 1 Analyse and compute the parameters of air pollutants

2. Evaluate procedures for control of pollution

UNIT III

Meteorology and Air Pollution:

Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena

on plume behavior and Air Quality - Wind rose diagrams and Isopleths Plume Rise Models

LO: 1. Study properties of atmosphere

2. Learn plume behaviour in different environmental conditions

UNIT IV

Air Pollution Control Methods:

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of Control Equipments –Control of NOx and SOx emissions – Environmental friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

LO: 1. Acquire the design principles of particulate and gaseous control.

2. Develop environmental friendly fuels and study properties

TEXT BOOKS:

1. M. N. Rao and H. V. N. Rao, Air Pollution, Tata McGraw Hill Company.
2. K. V. S. G. Murali Krishna, Air Pollution and Control Laxmi Publications, New Delhi, 2015.

REFERENCE BOOKS:

1. R. K. Trivedy and P. K. Goel, An Introduction to Air pollution, B.S. Publications.
2. Wark and Warner, Air Pollution, Harper & Row, New York.

E-RESOURCES:

http://www.nptelvideos.in/2012/11/environmental-air-pollution.html

PROFESSIONAL ELECTIVE-II

18A3201514-RAILWAY ENGINEERING

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Highway Engineering

Course Objectives:

1) Comprehend different parts of railway track their functions and operating system
2) Teach track construction and engineering applications
3) Explain different essential features and requirements of different types of crossings
4) Demonstrate signalling system and maintenance of tracks

Course Outcomes:

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

CO1 Explain components of Railway track, different Gauges.
CO2 Design Track Gradients as per given requirements.
CO3 Designing various types of Track Turnouts.
CO4 Discover purposes and facilities at railway stations.
CO5 Explain interlocking and modern signal systems.
CO6 Identify surface defects on Railway Track and their remedial measures.

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	3	3	3	-	-	2	-	1	-	-	-	-
CO3	3	3	3	-	-	2	-	1	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Components of Railway Track:

History and Importance of Indian Railways Construction and Maintenance- Components- Gauges, Types, Uniformity of Gauge- Different Gauges in Indian Railways- Associated problems- Ideal Alignment- Standard rail Sections- Causes and Effects of Creep- Measurement to reduce Creep- Fittings and Fastening- Factors effecting on tracks Coning

LO: 1. Understand the basics of railway components.

2. Examine gauges, alignment and standard rail sections

3. Explain different types of fittings and fastenings

UNIT II

Sleepers and Geometric Design of Tracks:

Functions and Requirements of sleepers- Types and Spacing- Methods of fixing rails with presressed Concrete and Wooden Sleepers- Details of Geometric Design of track-Gradient Grade compensation on curves- Curves and Super Elevation

LO: 1. Learn functions and requirements of sleepers

2. Design sleepers and tracks.

UNIT III

Resistance to Traction Points and Crossings:

Resistance to friction, wave action, track irregularity, wind- Resistance to Gradient, Curvature, Starting and acceleration- Stress in rails, sleepers, ballast and formations. Necessity of Points & Crossings. Track Layout and Turnouts- Types of crossings and Track Turnouts

LO: 1. Study causes of resistance to tracks

2. Evaluate stresses in rails

3. Design track layout and turnouts

Railway Stations and Yards. Purposes- Facilities required at Railway stations- Requirements of Station Yard- Classification of Yards

LO: 1. Study basics on railway stations and yards.

UNIT IV

Signalling and Interlocking Maintenance of Railway Track: Maintenance Programme- Monsoon, Pre Monsoon, Post Monsoon Maintenance- Causes for maintenance- Tools for Railway Track Maintenance & Their Functions- Surface defects and their remedial Measures

LO: 1. Develop knowledge on signalling and maintenance in railways.

3. Study requirements and different types of maintenance of tracks

Metro rails -History of metro rail in India -Types of metros -Classification of metro rails world wide - Reliability of metro rail than other modes of transport

TEXT BOOKS:

1. S. C. Saxena and S. P. Arora, A Text book of Railway Engineering, Dhanpatrai & Sons, Delhi
2. Satish Chandra and M. M. Agarwal, Railway Engineering- Oxford University Press, New Delhi

REFERENCE BOOKS:

1. R. Srinivasa Kumar, Transportation Engineering: Railways, Airports, Docks and Harbors Universities Press Pvt Ltd, Hyderabad. 2014.
2. Vazirani & Chandola, Transportation Engineering Vol I & II

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/urban-transportation-planning.html
- http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html

PROFESSIONAL ELECTIVE-II

18A3201515-GREEN BUILDINGS AND SUSTAINABILITY

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites: Basics of Civil engineering

Course Objectives:

1) Teach Students with concepts of Power potential in the world and India
2) Impart with different types of Hydropower Plants and Classification
3) demonstrate different Water Conveyance systems
4) Teach turbines draft tubes and water hammers
5) Throw light on Design of Power house planning

Course Outcomes:

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

CO1 Recognize what is a green building and green building materials.
CO2 Understand the Green Building Opportunities and Benefits
CO3 Differentiate different rating agencies and features of green buildings.
CO4 Recognize sources of carbon emissions and its impact on climate.
CO5 Understand the concept of Sustainable development and social ethics
CO6 Plan land use confirming to zonal regulations

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	1	-	-	-	-
CO2	2	-	-	-	-	-	2	1	-	-	-	-
CO3	2	-	-	-	-	-	2	1	-	-	-	-
CO4	2	-	-	-	-	-	2	1	-	-	-	-
CO5	2	-	-	-	-	-	2	1	-	-	-	-
CO6	2	-	-	-	-	-	2	1	-	-	-	-

UNIT I

Green Building-Benefits of Green Buildings- Green Building Materials and Equipment in India- Key Requisites for Constructing a Green Building, Important Sustainable features for Green Building

Green building concepts Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings

UNIT II

Green Building Opportunities and Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings.

Green Building Rating Systems- LEED India Rating System and Energy Efficiency

UNIT III

SUSTAINABILITY -Human development index, Sustainable development and social ethics, definitions of sustainability, populations and

consumptions.

THE CARBON CYCLE AND ENERGY BALANCES- Introduction, Climate science history, carbon sources and emissions, The carbon cycle, carbon flow pathways, and repositories, Global energy balance, Global energy balance and temperature model, Greenhouse gases and Effects, Climate change projections and impacts

UNIT IV

SUSTAINABILITY AND BUILT ENVIRONMENT

Introduction, Land use and land cover change, Land use planning and its role in sustainable development-Zoning and land use planning, smart growth, Environmentally sensitive design- low impact development, green infrastructure and conservation design, Green buildings and land use planning, Energy use and buildings

TEXT BOOKS:

1. Standard for the Design of High-Performance Green Buildings by ASHRAE
2. Engineering Applications in Sustainable Design and Development by Bradley A.Striebig, Adebayo A.Ogundipe and Maria Papadakis. First edition, 2016, CENGAGE Learning.

REFERENCE BOOKS:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.

PROFESSIONAL ELECTIVE-III

18A3201521-EXPANSIVE SOILS

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60

Prerequisites: Soil Mechanics and Foundation Engineering

Course Objectives:

1) Familiarize Students with Nature of Soils and Soil Structure
2) Equip student with concepts of Swelling and methods of determination
3) Understand foundation practices in expansive soils
4) Familiarize different materials and techniques for stabilization
5) Understand procedure to improve shear strength of expansive soils

Course Outcomes:

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

CO1 Demonstrate behaviour of expansive soils.
CO2 Explain need of foundation practice on expansive soils.
CO3 Perform methods of stabilization of expansive soils.
CO4 Select additives and methodology for stabilization.
CO5 Apply the gained knowledge for suitable performance.
CO6 Concepts of swelling

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	-	-	-	-
CO2	2	-	-	-	-	-	1	1	-	-	-	-
CO3	2	-	-	-	-	-	1	-	-	-	-	-
CO4	2	-	-	-	-	-	1	-	-	-	-	-
CO5	2	-	-	-	-	-	1	-	-	-	-	-
CO6	2	-	-	-	-	-	1	-	-	-	-	-

UNIT I

Clay Mineralogy: Nature of Soils-Clay mineral structure- Cation exchange – Soil water- Soil Structure-Soil water interaction

LO: 1. Understand mineralogical structure of soil.
2. Explain effects of soil water interaction

UNIT II

Swelling Characteristics- Swelling- Factors effecting Swelling- Swelling Potential- Swell Pressure- Methods of Determination-Factors effecting Swelling potential and swell pressure- Heave- Factors effecting Heave- Methods of determination of heave.

LO: 1. Understand swelling and its effects
2. Understand heave and its effects

UNIT III

Foundation Practices in Expansive Clays: Sand Cushion-Belled Piers-CNS layer technique-Under reamed Pile foundation- Construction Techniques- Design Specifications- Load-carrying capacity in compressive and uplift of single and multi under reamed piles in clays and sands-Granular pile Anchors.

LO: 1. Understand inconveniences with expansive soils

2. Design of foundation on expansive soils.

UNIT IV

Lime Soil columns and Lime Slurry pressure injection- Stabilization with admixtures-Propounding- Vertical and Horizontal Moisture barriers.

LO: Design of stability concepts with various admixtures.

Shear strength of expansive soils- Katti's concept of bilinear envelope- Stress –state variables in partly saturated soils- Freiend's strength parameters- Determination of matrix suction by axis translation technique- field suction measurement.

LO: 1. Determine shear strength of expansive soils by different techniques

TEXT BOOKS:

1. F. C. Chen, Foundation on Expansive Soils, Elsevier Scientific Publishing Company, Newyork
2. J. D. Nelson and D. I. Miller, Expansive soils- Problems and Practice in Foundation and pavement Engineering, John Wiley & Sons Inc

REFERENCE BOOKS:

1. D. G. Fredlund and H. Rhardjo, Soil Mechanics for Unsaturated Soils, WILEY Inter Science Publication, John Wiley & Sons, Inc
2. D. R. Katti, A. R. Katti, Behavior of Saturated Expansive Soils and Control Methods, Taylor and Francis

E-RESOURCES:

- http://www.btechmaterials.com/download/geotechnical-engineering-gte-material-notes/
- http://www.nptelvideos.in/2012/11/soil-mechanics.html

PROFESSIONAL ELECTIVE-III

18A3201522-REPAIR AND REHABILITATION OF STRUCTURES

Lecture – 3-0 Hours **Internal Marks:** 40
Tutorial:
Credits: 3 **External Marks:** 60

Prerequisites: Reinforced concrete structures, Concrete Technology

Course Objectives:

1) To describe causes of distress in concrete structures and plan repair strategies.
2) To explain issues on serviceability and durability of concrete.
3) To throw light on various repair materials and their characteristics.
4) To demonstrate repair techniques and protection measures.
5) To illustrate suitable retrofitting schemes.

Course Outcomes:

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

CO1 Understand evaluation procedure and plan for repair.
CO2 Design suitable rehabilitation scheme for serviceability and durability.
CO3 Choose suitable repair material for different magnitudes of distress.
CO4 Apply efficient repair and retrofitting schemes.
CO5 Understand the methods of strengthening methods for concrete structures
CO6 Physical evaluation on condition of the 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	2	-	-	-	2	-	-	-	-	-	-	-
CO2	2	3	3	-	2	1	-	1	-	-	-	-
CO3	2	-	-	-	2	-	-	-	-	-	-	-
CO4	2	-	-	-	2	-	-	-	-	-	-	-
CO5	2	-	-	-	2	-	-	-	-	-	-	-
CO6	2	-	-	-	2	-	-	-	-	-	-	-

UNIT I

Maintenance and repair strategies:

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

LO: 1. Understand importance and requirement of maintenance

2. Gain knowledge on quantification of repairs and documentation

UNIT II

Materials for Repair

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete.

LO: 1. List characteristics of materials used for repair.

2. Understand suitability of certain materials for a specific type of repair

UNIT III

Techniques for Repair And Protection Methods

Rust eliminators and polymers coating for rebars during repair, foamed

concrete, mortar and drypack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures – case studies

LO: 1. Explain techniques for repair and rehabilitation.

2. Understand methods of corrosion protection and inhibition

UNIT IV

Retrofitting of Structures

Repairs to overcome low member strength. Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

LO: Develop effective strategies for retrofitting.

TEXT BOOKS:

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials,
2. Maintenance and Repair, Longman Scientific and Technical, U.K.

REFERENCE BOOKS:

1. R T. Allen and S.C. Edwards, Repair of concrete Structures, Blakie and sons, UK.
2. Santhakumar, A. R. Training Course notes on damage assessment and Repair in Structures

E-RESOURCES:

- http://www.btechmaterials.com/download/rehabilitation-retrofitting-structures-materials-notes/

PROFESSIONAL ELECTIVE-III

18A3201523-INDUSTRIAL WASTE & WASTE-WATER ENGINEERING

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites: -------

Course Objectives:

1) To teach Health and Environment Concerns in waste water management
2) To teach material balance and design aspects of the reactors used in waste water treatment.
3) To impart knowledge on selection of treatment methods for industrial waste water
4) To teach common methods of treatment in different industries
5) To provide knowledge on operational problems of common effluent treatment plant

Course Outcomes:

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

CO1 Design treatment methods for any industrial wastewater.
CO2 Examine the manufacturing process of various industries.
CO3 Assess need for common effluent treatment plant for an industry
CO4 Test and analyse BOD, COD, TSS and MPN in wastewater.
CO5 Understand options for waste water disposal.
CO6 Understand the character of waste water from Steel plants and refineries

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	-	1	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Industrial water Quantity and Quality requirements:

Boiler and cooling waters–Process water for Textiles, Food processing, Brewery industries, power plants, fertilizers, sugar mills Selection of source based on quality, quantity and economics. Use of Municipal wastewater in Industries – Adsorption, Reverse Osmosis, Ion Exchange, Ultra filtration, Freezing, Elutriation, Removal of Colour, Odour and Taste.

LO: 1. Learn the procedures for assessment of quality of Industrial water

2. Suggest different processes of handling waste water

UNIT II

Basic theories of Industrial Wastewater Management: Industrial waste survey - Measurement of industrial wastewater Flow-generation rates – Industrial wastewater sampling and preservation of samples for analysis - Wastewater characterization-Toxicity of industrial effluents-Treatment of wastewater-unit operations and processes-volume and strength reduction – Neutralization and Equalization, Segregation and proportioning- recycling, reuse and resources recovery

LO: 1. Measurement of Industrial waste water

2. Characterize waste water

3. Suggest techniques for treatment of waste water.

UNIT III

Industrial wastewater disposal management: Discharges into Streams, Lakes and oceans and associated problems, Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges-Recirculation of Industrial Wastes- Effluent Disposal Method

LO: 1. Understand options for waste water disposal.

2. Explain functioning of common effluent treatment plants

UNIT IV

Process and Treatment of specific Industries-1: Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Steel plants, Fertilizers, Textiles, Paper and Pulp industries, Oil Refineries, Coal and Gas based Power Plants

LO: 1. Understand the character of waste water from Steel plants and refineries

2. Suggest suitable waste water treatment techniques

TEXT BOOKS:

1. M. N. Rao and A. K. Dutta, Wastewater Treatment, Oxford & IBH, New Delhi.
2. K.V. S. G. Murali Krishna, Industrial Water and Wastewater Management

REFERENCE BOOKS:

1. A. D. Patwardhan, Industrial Wastewater treatment, PHI Learning, Delhi
2. Metcalf and Eddy Inc., Wastewater Engineering, Tata McGraw Hill co., New Delhi.
3. G. L. Karia & R.A. Christian Wastewater Treatment- Concepts and Design Approach, Prentice Hall of India.

PROFESSIONAL ELECTIVE-III

18A3201524-DOCKS AND HARBOUR ENGINEERING

Lecture – Tutorial: 3-0 Hours **Internal Marks:** 40
Credits: 3 **External Marks:** 60
Prerequisites: ---------
Course Objectives:

1) To teach Water Transportation in India
2) To impart knowledge on water waves and effects on harbour and structure design
3) Development of facilities that are required for setting up of a port
4) Planning of ports for effective cargo handling and economical considerations

Course Outcomes:

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

CO1 Enhance the knowledge on Docks and Harbour Engineering for water transportation in the context of regional and intercontinental transportation.
CO2 Know techniques of planning the Infrastructures required for Harbour and Port area.
CO3 Know techniques of designing the Infrastructures required for Harbour and Port area.
CO4 Analyze cargo and passenger demand forecasting cargo handling capacity of ports and economic evaluation of port project.
CO5 Understand environmental and other impact impended due to water transportation and port activities.
CO6 Procedure to follow during planning of ports.

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	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2										
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	-	-	-	-	-	-	-	-	-	-	-

UNIT I

Water Transportation:

Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, canal, Inland water Transportation, Development of Port & Harbors, Harbor Classification, Site Selection, Harbor Dimensioning

***LO:* 1. Classify different modes of transportation by water**

2. Explain development and classification of ports and harbors

UNIT II

Natural Phenomena: Wind, Ties, Water waves, Wave decay & Ports, Wave Diffraction Breaking, Reflection, Littoral drift, Sedimentation transport, Effects on Harbor and Structure Design

LO: 1. Understand effects of natural forces

2. Understand conditions for design of harbors

Harbor Infrastructure:

Types of Break Waters, Jetty, Dock Fenders, Wharves, Dolphin Mooring accessories, Repair facilities, Wet Docks, Lift Docks, Dry Docks, Gates for Craving docks, Floating Docks, Slipways, Locks and Gates

LO: 1. Understand components of harbor.

UNIT III

Port Facility

Transit Shed, Warehouses, Cargo handling, Container Handling, Inland pot facility, Navigational Aids, Types, Requirements of Signals, Lighthouses, Bean lights, Buoys, Dredging & Coastal protection, Types of Dredges, Choices, usage of dredge material, Sea wall protection, Sea wall revetments, bulkhead

LO: 1. Knowledge on facilities to be developed in ports.

2. Decide different features to be incorporated in ports

UNIT IV

Planning of Ports:

Regional and intercontinental transportation development, forecasting cargo & Passenger demand, regional connectivity, Cargo handling, Capacity of Port, Economic Evaluation of Port projects, Impact of Port activities.

LO: 1. Study procedure to follow during planning of ports.

TEXT BOOKS:

1. Bindra, S.P., A Course in Docks and Harbor Engineering, Dhanpat Rai and Sons, New Delhi, India, 1992.
2. R. Srinivasa Kumar, Transportation Engineering. Railways, Airports, Docks and Harbors, Universities Press Pvt Ltd, Hyderabad. 2014.

REFERENCE BOOKS:

1. Seetharaman, S., Dock and Harbour Engineering, Umesh Publications, New Delhi, India, 1999.
2. V.N. Vazirani and S.P. Chandola, Docks and Harbour Engineering – Text book of Transport Engineering Vol. II, Khanna Publishers, New Delhi.

PROFESSIONAL ELECTIVE-III

18A3201525-WATER RESOURCES SYSTEM ANALYSIS

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Water Resource Engineering

Course Objectives:

1) Teach Concepts of systems techniques in water resources engineering
2) Teach Linear Optimization concepts
3) Demonstrate the Development system approach to reservoir operation
4) Planning water allocation to different crops
5) Expertise on River operation policies

Course Outcomes:

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

CO1 Apply basic principles of system approach.
CO2 Judging Economics of water resources of multipurpose projects.
CO3 Apply optimization principles to single and multi crop applications.
CO4 Designing reservoir operation leading to optimum crop water application.
CO5 Apply optimization methods to solve problems related to water resource systems
CO6 Formulate optimization models for decision making in water resources 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	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	2											
CO4	2	2	3	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	2	-	-	-	-	-	1	-	-	-	-

UNIT I

UNIT 1

Concept of System and System Analysis - Definition and Types of Systems - Basic Principles of Systems Approach and Analysis. Systems Techniques in Water Resources.

LO: 1. Understand the concepts of water resource system.

Introduction to Optimization - Linear and Dynamic Programming - Simulation - Combined Simulation and Optimization. Economics of Water Resources Projects - Cost Benefit Analysis - Cost Allocation among various projects in a Multi-purpose Project.

LO: 1. Explain optimization of water resource projects.

2. Carryout cost analysis on different projects

UNIT II

Systems Approach to Reservoir - Deterministic Flows - Reservoir Sizing and Reservoir Operations. Basic Concepts of Random Flows Reliability.

LO: 1. Learn types of operations in water resource system.

UNIT III

Application of Linear Programming to Water Resources Systems - Irrigation Water Allocation for Single and Multiple Crops. Reservoir Operation for Irrigation and Hydropower Generation.

LO: 1. Understand applications of linear programming on applications of water resource system for crops.

UNIT IV

Applications of Dynamic Programming to Water Resources Systems - Optimal Crop Water Application - Steady State Reservoir Operating Policy for Irrigation. Real Time Reservoir Operation for Irrigation.

LO: 1. Develope knowledge on operating systems for irrigation.

TEXT BOOKS:

1. Loucks, D. P. and Eelco Van Beek, Water Resources systems planning and management: An Introduction to methods, models and applications. (2005), UNESCO.
2. Vedula, S. and Mujumdar, P. P., Water resources Systems: Modeling techniques and analysis, (2005), Tata McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. Simonovic, S.P., Managing water resources: Methods and tools for a systems approach, (2009). UNESCO Publishing, France.
2. R. K. Sharma & T. K. Sharma, A Textbook Of Irrigation Engineering, S. Chand and Company Limited, New Delhi

E-RESOURCES:

- http://www.nptelvideos.in/2012/11/water-resources-systemsmodeling.html
- http://www.nptelvideos.in/2012/11/advanced-hydrology.html
- http://freevideolectures.com/Course/100/Water-Resources-Engineering
- http://www.btechmaterials.com/download/water-resources-engineering-materials-notes/
- http://www.btechmaterials.com/download/water-resources-engineering-ii-materials-notes/

Open Elective-3 (Offered by Department of civil engineering)

18A3201601-GREEN BUILDINGS

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

Prerequisites: Engineering chemistry, engineering geology and physics

Course Objectives:

- This course aims to highlight importance of Energy- Efficient Buildings within the context of Energy issues in the 21st century.
- To familiarize students with the concept of Energy efficiency, Renewable sources of energy and their effective adaptation in green buildings
- To give a fuller understanding of Building Form and Fabric, Infiltration,
- To give a fuller understanding of ventilation, Lighting, cooling and water conservation

Course Outcomes:

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

CO1 Understand why buildings should be made energy efficient.
CO2 Have a fuller grasp on Renewable Energy mechanisms such as Passive Solar heating
CO3 Have a fuller grasp on Ground source heat pumps, and their adaption to green
CO4 Understand the concepts of Site and Climate, Building Form, Building Fabric.
CO5 Understand the concepts of infiltration and ventilation, Lighting, Heating.
CO6 Understand the concepts of Cooling, Energy Management and water conservation.

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	-	-	-	-
CO3	2	2	-	-	-	1	-	2	-	-	-	-
CO4	3	-	-	-	-	1	-	2	-	-	-	-
CO5	2	2	-	-	-	-	-	2	-	-	-	-
CO6	3	1	-	-	-	2	-	2	-	-	-	-

UNIT I

Green Buildings within the Indian Context, Types of Energy, Energy Efficiency and Pollution, Better Buildings, Reducing energy consumption, Low energy design.

UNIT II

Renewable Energy sources that can be used in Green Buildings – Solar energy, Passive Solar Heating, Passive Solar collection, Wind and other renewable. A passive solar strategy, Photovoltaic's, Climate and Energy, Macro and Microclimate. Indian Examples.

UNIT III

Building Form – Surface area and Fabric Heat Loss, utilizing natural energy, Internal Planning, rouping of buildings.

Building Fabrics- Windows and doors, Floors, Walls, Masonry, Ecological walling systems, Thermal Properties of construction material.

UNIT IV

Infiltration and ventilation, Natural ventilation in commercial buildings, passive cooling, odelling air flow and ventilation, Concepts of daylight factors and day lighting, daylight assessment, artificial lighting, New light sources. Cooling buildings, passive cooling, and

mechanical cooling. Water conservation- taps, toilets and urinals, novel systems, collection and utilization of rain water.

TEXT BOOKS:

1. William T. Meyer. Energy Economics and Building Design. New York: McGraw- Hill Inc Indian Green Building Council
2. Public Technology, Inc. (1996). Sustainable Building Technical Manual: Green Building Design, Construction, and Operations. Public Technology, Inc., Washington, DC.

REFERENCE BOOKS:

1. Richard D. Rush, . Building System Integration Handbook, New York: John Wiley & Sons
2. Ben Farmer & Hentie Louw., Companion to Contemporary Architectural Thought, London & New York. Routledge
3. Peter Noever (edJ., Architecture in Transition: Between Deconstruction and New Modernism., Munich: Prestel.

E-RESOURCES:

http://nptel.ac.in/courses.php
http://jntuk-coeerd.in/

Open Elective-3 (Offered by Department of civil engineering)

19A3201602-BUILDING CONSTRUCTION

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

Prerequisites: Engineering chemistry, engineering geology and physics

Course Objectives:

- *To know about activities in building construction.*

Course Outcomes:

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

CO1 Understand types of foundation
CO2 Understand stone and brick masonry for the different construction activities in the
CO3 Understand block masonry for the different construction activities in the building
CO4 Comprehend the floors & roofs and their types
CO5 Comprehend the application of damp proofing, scaffolding
CO6 Comprehend the application of shoring, underpinning and formwork.

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	2	2	-	-	-	2	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	1	-	-	-	-
CO4	3	2	-	-	-	-	-	1	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-
CO6	2	1	-	-	-	1	-	1	-	-	-	-

UNIT I

FOUNDATIONS: Concept of foundations; Factors affecting selection of foundations; Types of foundations; Strip, Isolated, Strap, Combined Footings, Grillage foundations, Piles and their classification; Foundation on black cotton soils.

UNIT II

STONE, BRICK & BLOCK MASONRY: Technical terms; Classification of stone masonry; Types of bonds in brickwork and their suitability, Plan, elevation and section of brick bonds up to two bricks thickness; Classification of walls, Block masonry – Hollow concrete blocks – FAL- G Blocks, Hollow clay Blocks.

UNIT III

FLOORS & ROOFS: Technical terms; Types of ground floors; Classification of roofs.

UNIT IV

DAMP PROOFING, SCAFFOLDING, SHORING, UNDER PINNING & FORMWORK: Causes of dampness; Methods of preventing dampness; Types of scaffolding; Types of shoring; Methods of underpinning; Types of formwork

TEXT BOOKS:

1. Building construction, (10th edition) by Punmia, B. C., Laxmi Publications, Bangalore, 2009.

REFERENCE BOOKS:

1. Building construction and construction materials by Birdie, G.S. and Ahuja, T.D., Dhanpath Rai Publishing company. New Delhi. 1986.

E-RESOURCES:

http://nptel.ac.in/courses.php
http://jntuk-coeerd.in/

18A3201491-HIGHWAY ENGINEERING LAB

Practical's	3 Hours	**Internal Marks:**	40
Credits:	1.0	**External Marks:**	60

Prerequisites: Highway Engineering

Course Objectives:

- To test crushing value, impact resistance, specific gravity and water absorption,

percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.

- To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
- To test the stability for the given bitumen mix
- To carry out surveys for traffic volume, speed and parking.

Course Outcomes:

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

CO1 Ability to test aggregates and judge the suitability of materials for the road Construction

CO2 Ability to test the given bitumen samples and judge their suitability for the road construction

CO3 Ability to obtain the optimum bitumen content for the mix design

CO4 Ability to determine the traffic volume, speed and parking characteristics

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	-	-	-	-

List of Experiments

ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.

2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

V. DESIGN & DRAWING:

1. Earthwork calculations for road works.
2. Drawing of road cross sections.
3. Rotors intersection design

TEXT BOOKS:

Highway Material Testing Manual' by S.K. Khanna, C.E.G.Justo and A.Veeraraghavan, Nem Chan Brothers New Chand Publications, 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:

18A3201391-COMPUTER AIDED CIVIL ENGINEERING DRAWING

Practical's	3 Hours	**Internal Marks:**	40
Credits:	1.0	**External Marks:**	60

Prerequisites: Reinforced Concrete Structures and Building Planning

Course Objectives:

1) To make the student prepare engineering drawings conventionally involving various design parameters.
2) To introduce fundamentals of computer aided drawing in Civil Engineering.
3) to enable the student develop drawing of building components
4) to train the student in Producing 2D & 3D drawings
5) to enable the students Communicate designs graphically
6) to teach methodologies for understanding and verification of CAD

Course Outcomes:

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

CO1 Develop drawing skills for effective demonstration of building details

CO2 Draw building plans using Computer Aided Design and Drafting software's.

CO3 Develop engineering project drawings incorporating details and design parameters in 2D & 3D.

CO4 Examine efficacy of CAD 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
CO1	3	3	-	3	-	2	-	2	-	-	-	-
CO2	3	3	-	3	-	2	-	2	-	-	-	-
CO3	3	3	-	3	-	2	-	2	-	-	-	-
CO4	3	3	-	3	-	2	-	2	-	-	-	-

List of Experiments

1. **Sign conventions and symbols**
2. **Masonry bonds**
3. **Doors and windows**
4. **Buildings with load bearing walls including details of doors and windows.**
5. **Taking standard drawings of a typical two storied building including all MEP.**
6. **Joinery, rebars, finishing and other details and writing out a description of the RCC framed structures**
7. **Reinforcement drawings for typical slabs, beams, columns and spread footings. Industrial buildings - North light roof structures - Trusses**
8. **Perspective view of one and two storey buildings**

TEXT BOOKS:

1. Engineering Graphics, K.C. john, PHI Publications.
2. Engineering drawing by N.D Bhatt, Charotar 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 – PK Dhawan, S Chand
6. Engineering Drawing – MB Shaw, BC Rana, Pearson

E-RESOURCES:

18A3200801-ESSENCE OF INDIAN KNOWLEDGE AND TRADITIONS

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

Course Objectives:

6. To develop knowledge of fundamental management concepts, skills and tools, to aid in problem solving and decision making.
7. To develop and understanding about the organizational structure and relationship between authority and responsibility in various structures.
8. To discuss the evolution of principles that make it possible to design facilities, processes, and control systems with a degree of predictability as to their performance.
9. To develop comprehensive skills in planning, selecting, motivating, and developing the human resources for organisational effectiveness.
10. To understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing.

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 Develop comprehensive skills in planning, selecting, motivating, and developing the human resources for organisational effectiveness.
CO6 Understand the broad scope of marketing, societal, ethical and other diverse aspects of marketing

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		-	-	-
CO2	2	-	-	-	-	-	-	2		-	-	-
CO3	2	-	-	-	-	-	-	2		-	-	-
CO4	2	-	-	-	-	-	-	2		-	-	-
CO5	2	-	-	-	-	-	-	2		-	-	-
CO6	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.

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 III

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 IV

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.

TEXT 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, PratibhaPrakashan 2012.

REFERENCE BOOKS:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

NRI INSTITUTE OF TECHNOLOGY

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

DEPARTMENT OF CIVIL ENGINEERING NRIA-20

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I 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	20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	4
3	20A1100202	Engg. Physics	3	0	0	3	30	70	100	3
4	20A1101401	Engg. Drawing	1	0	4	5	30	70	100	3
5	20A1102301	BASIC ELECTRICAL ENGINEERING	3	0	0	3	30	70	100	3
6	20A1100291	Engg. Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1101391	Basics of Civil &Electrical Engg. Work Shop (Lab)	0	0	3	3	15	35	50	1.5
		Total	**13**	**1**	**10**	**24**	**180**	**420**	**600**	**19**

I 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	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200204	Engg. Chemistry	3	0	0	3	30	70	100	3
3	20A1201401	Theory of Mechanics	3	0	0	3	30	70	100	3
4	20A1205301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
5	20A1201402	Building Material & Concrete technology	3	0	0	3	30	70	100	3
6	20A1200293	Engg. Chemistry Lab	0	0	3	3	15	35	50	1.5
7	20A1205391	Programming and Problem Solving with C Lab	0	0	3	3	15	35	50	1.5
8	20A1201491	Building Planning and Computer Aided Building Drawing	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English lAB	0	0	3	3	15	35	50	1.5
10	20A1200801	Environmental Sciences	2	0	0	2	30	70*	100	0
		Total	**17**	**0**	**12**	**29**	**240**	**560**	**800**	**21**

*** Internal Evaluation**

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

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

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POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), VIJAYAWADA-PIN – 521212

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR I – SEMESTER

S No	Course Code	Title of the Course	Scheme of Instruction (Periods per Week)			Total Contact Hours	Scheme of Examination (Maximum Marks)			No. of Credits
			Lecture	Tutorial	Practical		CIA	SEA	Total	
1	18A3103601 18A3103602	**Open Elective - II** 1. Introduction to Material Handling Equipment. 2. Introduction to Robotics	3	0	0	3	40	60	100	3
2	18A3103401	Design of Machine Elements–II	3	0	0	3	40	60	100	3
3	18A3103402	Dynamics of Machinery	3	0	0	3	40	60	100	3
4	18A3103403	Manufacturing Technology	3	0	0	3	40	60	100	3
5	18A3103404	Applied Thermodynamics	3	0	0	3	40	60	100	3
6	18A3103511 18A3103512 18A3103513 18A3103514	**Professional Elective - I** 1. Rapid Prototyping 2. Automation in Manufacturing 3. Hydraulic and Pneumatic Systems 4. Electric & Hybrid Vehicles	3	0	0	3	40	60	100	3
7	18A3100801	Indian Constitution	3	0	0	3	40	60	100	
8	18A3103491	Machine Tools Lab	0	0	2	2	40	60	100	1
9	18A3103492	Theory of Machines Lab	0	0	2	2	40	60	100	1
10	18A3103791	Minor Project (Design and Fabrication)	0	0	2	2	40	60	100	1
		Total	21	0	8	29	400	600	1000	
		Total credits								**21**

Hod, Mechanical Department
NRI Institute of Technology
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Agiripalli (Md), Krishna Dist.

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR II – SEMESTER

S No	Course Code	Name of the Course	Scheme of Instruction (Periods per Week)			Total Contact Hours	Scheme of Examination (Maximum Marks)			No. of Credits
			Lecture	Tutorial	Practical		CIA	SEA	Total	
1	18A3203401	Heat Transfer	3	0	0	3	40	60	100	3
2	18A3203402	Operations Research	3	0	0	3	40	60	100	3
3	18A3203403	Finite Element Methods	3	0	0	3	40	60	100	3
4	18A3203301	Instrumentation & Control Systems	3	0	0	3	40	60	100	3
5	18A3203601 18A3203601	**Open Elective – III** 1. Mechatronics 2. Hydraulic and Pneumatic Systems	3	0	0	3	40	60	100	3
6	18A3203511	**Professional Elective - II** 1. Computational Fluid Dynamics 2. Robotics 3. Non Destructive Evaluation 4. Introduction to Material Handling Equipment.	3	0	0	3	40	60	100	3
7	18A3200801	IPR and Patents	3	0	0	3	40	60	100	0
8	18A3203491	Heat Transfer Lab	0	0	2	2	40	60	100	1
9	18A3203491	Simulation Lab	0	0	2	2	40	60	100	1
		Total	21	0	6	27	400	600	1000	
		Total credits								**20**

Head, Mechanical Department
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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR I – SEMESTER

S No	Course Code	Title of the Course	Scheme of Instruction (Periods per Week)			Total Contact Hours	Scheme of Examination (Maximum Marks)			No. of Credits
			Lecture	Tutorial	Practical		CIA	SEA	Total	
1	18A3103601 18A3103602	**Open Elective - II** 1. Introduction to Material Handling Equipment. 2. Introduction to Robotics	3	0	0	3	40	60	100	3
2	18A3103401	Design of Machine Elements–II	3	0	0	3	40	60	100	3
3	18A3103402	Dynamics of Machinery	3	0	0	3	40	60	100	3
4	18A3103403	Manufacturing Technology	3	0	0	3	40	60	100	3
5	18A3103404	Applied Thermodynamics	3	0	0	3	40	60	100	3
6	18A3103511 18A3103512 18A3103513 18A3103514	**Professional Elective - I** 1. Rapid Prototyping 2. Automation in Manufacturing 3. Hydraulic and Pneumatic Systems 4. Electric & Hybrid Vehicles	3	0	0	3	40	60	100	3
7	18A3100801	Indian Constitution	3	0	0	3	40	60	100	
8	18A3103491	Machine Tools Lab	0	0	2	2	40	60	100	1
9	18A3103492	Theory of Machines Lab	0	0	2	2	40	60	100	1
10	18A3103791	Minor Project (Design and Fabrication)	0	0	2	2	40	60	100	1
		Total	21	0	8	29	400	600	1000	
Total credits										**21**

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR II – SEMESTER

S No	Course Code	Name of the Course	Scheme of Instruction (Periods per Week)			Total Contact Hours	Scheme of Examination (Maximum Marks)			No. of Credits
			Lecture	Tutorial	Practical		CIA	SEA	Total	
1	18A3203401	Heat Transfer	3	0	0	3	40	60	100	3
2	18A3203402	Operations Research	3	0	0	3	40	60	100	3
3	18A3203403	Finite Element Methods	3	0	0	3	40	60	100	3
4	18A3203301	Instrumentation & Control Systems	3	0	0	3	40	60	100	3
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6	18A3203511	**Professional Elective - II** 1. Computational Fluid Dynamics 2. Robotics 3. Non Destructive Evaluation 4. Introduction to Material Handling Equipment.	3	0	0	3	40	60	100	3
7	18A3200801	IPR and Patents	3	0	0	3	40	60	100	0
8	18A3203491	Heat Transfer Lab	0	0	2	2	40	60	100	1
9	18A3203491	Simulation Lab	0	0	2	2	40	60	100	1
		Total	21	0	6	27	400	600	1000	
Total credits										**20**

III B. Tech I Semester

Course Code:

INTRODUCTION TO MATERIAL HANDLING EQUIPMENT

(Open Elective – II)

Lecture – Tutorial:	**3 - 0 Hours**	**Internal Marks:**	**40**
Credits:	**3**	**External Marks:**	**60**

Prerequisites: NIL

Course Objectives:

1. The student will know the basic Fundamentals of Material Handling Equipment and control and safety measures incorporated on material handling equipments.
2. The student will identify and select the different handling equipments in industry.
3. The student will identify various components of material handling systems.
4. The student will know the working principles of Components of material handling systems like Flexible hoisting, hooks, elevators.
5. The student will know the working principles of Components of material handling systems like conveyors.
6. To know the operational features of various material handling system used in industries how to connect loading stations to the different discharge or unloading conditions

Course Outcomes:

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

CO1	Understand the basic Fundamentals of Material Handling Equipment.
CO2	Identify, compare and select proper material handling equipment for specific applications.
CO3	Identify the various components of material handling systems.
CO4	Understand the working principles of Components of material handling systems like Flexible hoisting, hooks, elevators.
CO5	Understand the working principles of Components of material handling systems like conveyors.
CO6	Identify the surface transport to connect loading stations to the different discharge or unloading stations.

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	2	1		1		1						
CO3	2	1		1		1						
CO4	2	1		1		1						
CO5	2	1		1		1						
CO6	2	1		1		1						

UNIT I

Materials Handling Equipment: Introduction to material handling Equipment, Detail classification of MHE, Application and their selection. Criteria for selection of Material Handling Equipment's,

Factors effecting choice of material handling equipments: type of loads, hourly capacity, direction and length of travel, method of stacking at initial intermediate and final points-specific load conditions, Basic kind of material handling problems, Various methods to analyze material Handling problems, Economics of material handling systems.

UNIT II

Components of material handling systems: Flexible hoisting appliances such as welded chains, roller chains, hemp ropes, and steel wire ropes, fastening methods of wire and chains, Appliances for suspending hooks-crane grab for unit and piece loads.

Lifting Methods: Lifting tackles, lifting and rigging Load handling attachments Various types of hooks-forged, eye bolts, eye hook, electric lifting magnet, vacuum lifter, grabbing attachment for loose materials, crane attachment for handling liquids/ molten metal's.

UNIT III

Hoisting machinery and equipments: Working of different type of hoists such as lever operated hoist, portable hand chain hoist, differential hoist, worm geared and spur geared hoist, electric and pneumatic hoists.

Working of different types of cranes and Industrial Lifts: rotary cranes, trackless cranes, mobile cranes, bridge cranes, cable cranes, floating cranes and cranes traveling on guide rails. Introduction to types of Industrial Lifts.

UNIT IV

Conveying machinery: Working of traction type conveyors such as belt conveyors, chain conveyors, Working of traction less type conveyors such as gravity type conveyors, vibrating and oscillating conveyors, screw conveyors, monorail conveyors, pneumatic and hydraulic conveyors, hoppers, gates and feeders.

Surface transport equipment–functions–working of trackless equipment such as hand operated trucks, powered trucks, tractors, AGV (Automatic Guided vehicle), industrial trailers Function, working of cross handling equipment such as winches, capstans, turntables, transfer tables.

TEXT BOOKS:

1. Material Handling Equipment – N.Rundenko (Peace Publisher, Moscow)
2. Material Handling Equipment -M.P. Alexandrow (MIR Publishers, Moscow)
3. Material Handling Equipment -R.B. Chowdary & G.N.R.Tagore (Khanna Publishers, Delhi)
4. Plant layout & Material Handling-Apple J.M (John Wiley Publishers)

REFERENCE BOOKS:

1. Material Handling (Principles &Practice)-Allegri T.H (CBS Publisher, Delhi)
2. Material Handling -Immer J.R (McGraw Hill, Newyork
3. Material Handling Equipment-Parameswaran M.A (CDC in Mech. Engg., I.I.T. Chennai).
4.Conveyors and related equipments – Spivakovsy A.O. and Dyachkov V.K Volumes I and II (MIR publishers)
5.Boltzharol, A.,"Materials Handling Handbook", The Ronald press company 1958.

E-RESOURCES:

https://www.youtube.com/watch?v=3tTvVUfwchI
https://www.youtube.com/watch?v=guYD2zyUT6o
https://people.engr.ncsu.edu/kay/Material_Handling_Equipment.pdf
https://www.scribd.com/doc/222647028/Material-Handling-Full-Notes

III B. Tech I Semester

Course Code:

INTRODUCTION TO ROBOTICS

(Open Elective – II)

Lecture – Tutorial:	3-0 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.

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

TEXT BOOKS

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 text book, 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://nptel.ac.in/courses/112/101/112101099/
https://nptel.ac.in/courses/112/101/112101098/
https://www.coursera.org/specializations/robotics

III B. Tech I Semester

Course Code:

DESIGN OF MACHINE ELEMENTS – II

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

Prerequisites:

Mechanics of Materials, Design of Machine Elements-I

Course Objectives:

1. The student shall gain appreciation and understanding of the design and selection of bearings and chain drives.
2. Selection of proper gears based on their static, dynamic and wear load and check beam strength.
3. Learn and understanding the design procedure of different types of clutches and brakes and design flywheel.
4. Design procedure for the different machine elements such as connecting rod, crank shaft, piston and cylinder etc.

Course Outcomes:

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

CO1	Estimate the bearing life and selection of suitable bearing.
CO2	Analyze and design of chain drive.
CO3	Analyze the forces, calculate the static and dynamic loads on gears.
CO4	Analyze and design of different types of clutches and brakes.
CO5	Analyze and design of flywheel.
CO6	Analyze and design of IC Engine components.

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	1		1			2	2	2
CO2	3	3	3	2	1		1			2	2	2
CO3	3	3	3	2	1		1			2	2	2
CO4	3	3	3	2	1		1			2	2	2
CO5	3	3	3	2	1		1			2	2	2
CO6	3	3	3	2	1		1			2	2	2

UNIT I

Bearings: Sliding contact bearings: Classification and types of bearings- bearing materials - applications – bearing characteristic number and bearing modulus – Sommerfeld number – Coefficient of friction and heat dissipation of bearings – journal bearing design – properties of lubrication.

Rolling contact bearings: Types of ball and roller bearings – advantages and disadvantages over sliding contact bearings – static and dynamic equivalent load for roller bearings, bearing life – Reliability – Selection of ball bearings.

Chain Drive: Geometric relationships, polygonal effect, Design of chain drive.

UNIT II

Gears: Spur gears- Beam strength- Lewis equation – static, dynamic and wear tooth load– load– design analysis of spur gears – estimation of centre distance, module and face width, check for dynamic and wear considerations.
Helical gears: Virtual number of teeth, Force analysis, Beam strength – design analysis of helical gears.
Bevel gears: Force analysis, Beam strength, Wear strength, Effective load, Design of bevel gears.

UNIT III

Clutches, Brakes, Fly Wheel – **Clutches:** Torque transmitting capacity, Multi-disk clutches, cone clutch, friction materials.
Brakes: Energy equations, Block and Band brakes, Internal expanding brake.
Flywheel: Torque analysis, Design of solid disk and rimmed flywheel.

UNIT IV

Design of IC Engine Components: **Connecting Rod**: Thrust in connecting rod – stress due to whipping action on connecting rod ends – Design of crank shaft: strength and proportions of over hung and center cranks – crank pins.
Design of Piston: forces acting on piston – construction design and proportions of piston, **Design of cylinder**: cylinder liners and heads.

Note: Design data book is Permitted for examination

TEXT BOOKS

1. Design of Machine Elements/V.B. Bhandari/ McGraw Hill Publishers
2. Machine Design/ Shigley, J.E/McGraw Hill.

REFERENCE BOOKS:

1. Design of Machine Elements/V.B. Bhandari/ McGraw Hill Publishers
2. Machine design / NC Pandya & CS Shah/Charotar Publishing House Pvt. Limited
3. Machine design / Schaum Series/McGraw Hill Professional
4. Machine Design/ Shigley, J.E/McGraw Hill.
5. Design data handbook/ PSG
6. Design data handbook/Jalaludeen.
7. Design of machine elements-Spotts/Pearson Publications
8. Machine Design –Norton/ Pearson publishers

E-RESOURCES:

1. https://nptel.ac.in/courses/112105124/
2. https://www.youtube.com/watch?v=mzWMdZZaIIwI&list=PL3D4EECEFAA99D9BE

III B. Tech I Semester

Course Code:

DYNAMICS OF MACHINERY

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

Prerequisites:

Fundamentals of Engineering Mathematics, Engineering Mechanics, Kinematics of Machinery

Course Objectives:

1. To understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
2. To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
3. To understand the principles in mechanisms used for speed control and stability control.
4. To understand the effect of Dynamics of undesirable vibrations.

Course Outcomes:

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

CO1	Analyze dynamic force analysis of slider crank mechanism.
CO2	Analyze and design a flywheel.
CO3	Compute balancing forces in systems with reciprocating and rotary masses.
CO4	Analyze the forces in governors.
CO5	Analyze stabilization of automobiles, airplanes and ships.
CO6	Estimate the effects of natural and forced undesirable vibrations.

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						1
CO2	3	2	1									1
CO3	3	2	1									1
CO4	3	2	1									1
CO5	3	2	1									1
CO6	3	2	1									1

UNIT I

Force Analysis

Static and Dynamic Force Analysis:

Static force analysis of mechanisms - D' Alembert's principle - Inertia force and inertia torque.

Dynamic Force Analysis - Dynamic Analysis of reciprocating engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque.

Flywheels - Turning moment diagrams - Flywheels of engines and punch press.

UNIT II

Balancing

Balancing of rotating masses - Static and dynamic balancing - Balancing of rotating masses single and multiple – single and different planes

Balancing of reciprocating masses: Balancing a single cylinder Engine - Primary and secondary unbalanced forces - Balancing Multi cylinder, inline and V-engines – Partial balancing in engines,

Locomotive balancing, hammer blow, swaying couple, variation of tractive effort.

UNIT III

Mechanism For Control

Governors: Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors - Sensitiveness, isochronism and hunting Characteristics - Effect of friction - Controlling Force.

Gyroscope: Gyroscopic couple - Gyroscopic stabilization - Gyroscopic effects in Automobiles (two-wheeler and four-wheeler), Airplanes and Ships

UNIT IV

Vibrations

Single degree free vibrations,

Basic features of vibratory systems – Degrees of freedom – single degree of freedom – Free vibration – Equations of motion – Natural frequency – Types of Damping – Damped vibration– Torsional vibration of shaft – Critical speeds of shafts – Torsional vibration – Two and three rotor torsional systems. Forced vibrations

Response of one-degree freedom systems to periodic forcing – Harmonic disturbances –Disturbance caused by unbalance – Support motion –transmissibility – Vibration isolation vibration measurement.

TEXT BOOKS

1. Theory of Machines / S.S Rattan/ Mc. Graw Hill
2. Mechanism and machine theory /Ashok G. Ambedkar/PHI Publications.
3. Sadhu Singh - 'Theory of Machines' - Pearson Education - 2011 - 3rd Edition
4. S. S. Rao - 'Mechanical Vibrations' - Pearson Education Inc. - 2011 - 5th Edition

REFERENCE BOOKS:

1. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
2. Theory of Machines / Shigley / MGH
3. Theory of Machines / Thomas Bevan / CBS Publishers
4. Theory of machines / Khurmi/S.Chand.
5. V. P. Singh, - 'Mechanical Vibrations' – Dhanpat Rai & Company Pvt. Ltd. - 2014 - 3rd Edition
6. W. T. Thomson and Marie Dillon Dahleh - 'Theory of Vibration with Applications' - Pearson Education - 2007 - 5th Edition

E-RESOURCES:

https://www.youtube.com/playlist?list=PL46AAEDA6ABAFCA78

https://nptel.ac.in/courses/112/104/112104114/

III B. Tech I Semester

Course Code:

MANUFACTURING TECHNOLOGY

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

Prerequisites:

Manufacturing Process

Course Objectives:

1. To understand the concept and basic mechanics of metal cutting.
2. Study working of standard machine tools such as lathe, shaping and allied machines
3. To understand milling, drilling and allied machines, grinding and allied machines and broaching
4. To understand the basic concepts of non-traditional machining processes
5. To introduce students to the scientific principles underlying material behavior during manufacturing processes so as to enable them to undertake calculations of forces, tool stresses and material removal rates.
6. To introduce the fundamentals of digital manufacturing.

Course Outcomes:

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

CO1	Upon completion of this course, the students will be able to understand and compare the functions and applications of different metal cutting tools.
CO2	Upon completion of this course, the students can able to apply the different metal removing ,finishing and super finishing and for component production
CO3	Learn the basic concepts of NTM.
CO4	Learn surface finishing techniques
CO5	Apply cutting mechanics to metal machining based on cutting force and power consumption
CO6	Get a basic knowledge on the importance of digital manufacturing.

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		1		2							
CO3	3		2									
CO4	3		2									
CO5	3		2									
CO6	3		2		3							

UNIT I

Introduction : Manufacturing technology

Mechanics of Metal Cutting : Tool nomenclature ,Orthogonal and oblique cutting - Mechanism of metal removal,Mechanism of chip formation – Types of chips, need and types of chip breakers Analysis of cutting forces in orthogonal cutting– Work done, power required (simple problems) ,Friction forces in metal cutting – development of cutting tool materials

Thermal aspects of machining -Tool wear and wear mechanisms ,Factors affecting tool life

UNIT II

Lathe, Milling and Drilling Machine:
Lathe, types of lathes-special purpose lathes-kinematics arrangement of lathe, -work holding devices-types of milling machines-types of milling machine-schematic diagrams,-operations, milling cutters-mounting of cutters-Drilling machines-types-reaming and boring operations

UNIT III

Boring, Shaper, Slotter, Planer, Broaching:
Schematic diagram of boring machine, shaper, planer, slotting and broaching machine-operations tools. Grinding and allied finishing process. Forces, power consumption in machinery
Forces and power consumption in turning, drilling, milling and grinding, forces in up and down milling, chip thickness calculation.

UNIT IV

Introduction to Digital Manufacturing: Concepts and of digital manufacturing Definition of digital manufacturing – Features and development of digital manufacturing.
Theory system of digital manufacturing science: Operation Mode and Architecture of Digital Manufacturing System

TEXT BOOKS

1. Manufacturing processes for engineering material-KalpakJain.
2. Materials & processes in Manufacturing-DE Garmo Black Khoser.
3. Manufacturing process, P C Pandey
4. Zude Zhou, Shane (Shengquan) Xie and Dejun Chen, Fundamentals of Digital Manufacturing Science, Springer-Verlag London Limited,2012

REFERENCE BOOKS:

1. Metal cutting principles , Oxford, Clarendon PressShaw M.C.,
2. Metal Cutting Theory and Practice, Bhattacharya A.
3. R.K. Jain , Production Technology /Khanna Publishers, 17thEdition, 2012.
4. Lindberg, Process and materials of manufacturing, PE.
5. Sarma P C, Production Technology, S Chand & Company Ltd, 3rdEdition, 2012.
6. Handbook of Metal forming ", Kurt Lunge ,McGraw Hill, Pub Co.

E-RESOURCES:
https://www.youtube.com/watch?v=TkaCddeEZEY
https://nptel.ac.in/courses/112/107/112107077/

III B. Tech I Semester

Course Code:

APPLIED THERMODYNAMICS

(Steam tables and Mollier chart are permitted)

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

Prerequisites:

Basic Thermodynamics

Course Objectives:

1. To make the Student learn the basic knowledge of components being used in steam power plant cycle.
2. To familiarize the student with the various vapour cycle analysis along with their function and necessity.
3. To learn about analyze the energy transfers and transformations of vapour power plant cycle components including individual performance evaluation.
4. To make the Students learn to construct velocity triangles and to calculate power and efficiency of steam turbines.
5. To make the Students learn about different types of compressors and to calculate power and efficiency of reciprocating compressors.
6. To make the Students learn mechanical details and to calculate power and efficiency of rotary compressors.

Course Outcomes:

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

CO1	Describe the components and functioning of a Rankine cycle
CO2	Analyze the need of various boiler draught systems for a vapor power cycle.
CO3	Apply thermodynamic analysis to study the behavior of steam nozzles.
CO4	Evaluate the performance of impulse, reaction turbines.
CO5	To Understand different types of condensers and its performance analysis.
CO6	Evaluate the performance of reciprocating, rotary and dynamic compressors.

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	2	2									
CO4	3	3	2									
CO5	3	2	1									
CO6	3	3	2									

UNIT I

Basic Layout of Steam Power Plant: Introduction, Rankine Cycle, Actual Vapour Power Cycle, Methods to improve efficiency of Rankine cycle, Reheating and Regeneration, Fuels used in power plant.

Steam Generators: Introduction, Boiler systems-Function and Classification, Fire Tube boilers-Cornish, Lancashire, Cochran, Water Tube boilers-Babcock and Wilcox, High pressure boilers-

Loeffler, lamont and Benson boilers, Boiler Mountings and Accessories. Performance of boilers.

UNIT II

Steam Nozzles: Introduction, Types of nozzle, Flow through nozzles- thermodynamic analysis, velocity of nozzle at exit, condition for maximum discharge, critical pressure ratio, Ideal and actual expansion in nozzle, velocity coefficient.

Steam Condensers: Introduction, Elements of a condenser plant, Types of Condensers- Jet condensers, Surface Condensers –working principle-vacuum efficiency and condenser efficiency.
Draught: Functions, Types -Height of chimney for given draught and discharge, Condition for maximum discharge, Efficiency of chimney, artificial draught- induced and forced.

UNIT III

Steam Turbines - Introduction, Classifications of steam turbines.

Impulse Turbines: Impulse turbine- Mechanical details, Working principle, Velocity triangles – effect of friction – power developed, axial thrust, blade or diagram efficiency -condition for maximum efficiency. De-Laval Turbine - its features. Methods used to reduce rotor speed.

Reaction Turbines: Introduction, Parson's reaction turbine, performance analysis, degree of reaction, velocity triangles, condition for maximum efficiency.

UNIT IV

Compressors– Introduction, Classification.

Reciprocating Compressors: Principle of operation, Work required, Isothermal efficiency, volumetric efficiency and Effect of clearance volume, Free Air Delivery, Multistage Compression. Condition for Minimum work.
Rotary Compressors: Roots blower and Vane's sealed compressor-principle of working and applications.
Centrifugal Compressors: Construction, Principle of operation –Energy transfer-velocity diagram
Axial Flow Compressors: Construction, Principle of operation – velocity triangles and energy transfer per stage, degree of reaction.

TEXT BOOKS

1.Thermodynamics and Heat Engines/ R.Yadav,Volume -II/ Central Publishing House
2. Mahesh.M. Rathore, Thermal Engineering,TMH,1st Edition, 2012.
3. R.K.Rajput, Thermal Engineering, Laxmi publications, 5th Edition, 2005.

REFERENCE BOOKS:

1. Thermal Engineering-P.L.Bellaney/ Khanna publishers.
2. T.D Eastop and A. McConkey, Applied Thermodynamics, Pearson 5th Edition 2013.
3. R. Yadav,Thermodynamics and Heat Engines,Vol-II,Central Book Depot,5th Edtn,1999.
4. R.S.Khurmi ,Thermal Engineering , S.Chand& Company, 1st Edition , 2012.
5. P.K Nag, Power Plant Engineering, TMH, 3rd Edition 2012.

E-RESOURCES:

1.https://nptel.ac.in/courses/112/103/112103277/

2.https://lecturenotes.in/subject/152/power-plant-engineering-ppe

III B. Tech I Semester

Course Code:

RAPID PROTOTYPING

(Professional Elective – I)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Computer Aided Design, Engineering Materials

Course Objectives:

1. Student will know the concept of Rapid Prototyping, classifications, models, specifications of various Rapid Prototype Techniques.
2. Student can understand the fundamentals of various Additive Manufacturing Technologies for application to various industrial needs.
3. Students will able to understand the method of manufacturing of liquid based, powder based and solid based techniques.
4. Student will be aware of the manufacturing procedure of a prototype using FDM technique.
5. Student will know the different tools, soft-wares required and the applications of Rapid Prototyping.
6. Student will be in a position to convert part file into STL format.

Course Outcomes:

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

CO1	Understand the fundamentals of Additive Manufacturing Technologies for engineering and industrial applications.
CO2	Understand the methodology to manufacture the products using SLA and SGC technologies and study their applications, advantages and case studies.
CO3	Understand the methodology to manufacture the products using LOM and FDM technologies and study their applications , advantages and case studies
CO4	Understand the methodology to manufacture the products using SLS and 3D Printing technologies and study their applications, advantages and case studies.
CO5	Evaluate performance of the different types of rapid tools using in RP technologies.
CO6	Evaluate the different types of STL formats, and other Translators.

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				1					
CO2	3	2	3									
CO3		3	2									
CO4	3	3	2									
CO5	3	3	2				2					
CO6	3	3	2		2							

UNIT I

Introduction: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, differences between traditional processes and additive manufacturing production, classification of RP process. RP Applications in engineering.

Liquid-Based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, photopolymers, photo polymerization, layering

technology, laser and laser scanning, applications, advantages and disadvantages, case studies.
Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT II

Solid-Based Rapid Prototyping Systems: Laminated object manufacturing (LOM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

Fused Deposition Modeling (FDM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Direct metal deposition (DMD): working principle, Process, applications, advantages and disadvantages, Case study

UNIT III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

Three Dimensional Printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Materials of RP Technology: Photo sensitive Resin, Wax etc.

UNIT IV

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 Kel tool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

Rapid Prototyping Data Formats: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file Repairs: Generic Solution, other Translators, Newly Proposed Formats, Features of various RP software's.

TEXT BOOKS

1. Rapid prototyping: Principles and Applications – Chua C.K., Leong K.F. and LIM C.S, World Scientific publications.
2. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
3. Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
4. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011

REFERENCE BOOKS:

1. Rapid Manufacturing – D.T. Pham and S.S. Dimov, Springer.
2. Wholers Report 2000 – Terry Wohlers, Wohlers Associates.
3. Rapid Prototyping & Manufacturing – Paul F.Jacobs, ASME Press.
4. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rdEd., 2010
5. D.T. Pham and S.S. Dimov, "Rapid Manufacturing", Springer, 2001
6. Terry Wohlers, " Wholers Report 2000", Wohlers Associates, 2000
7. Paul F. Jacobs, " Rapid Prototyping and Manufacturing"–, ASME Press, 1996
8. Ian Gibson, Davin Rosen, Brent Stucker "Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

E-RESOURCES:

1.https://www.coursera.org/learn/3d-printing-revolution/home/welcome
2. http://asmedl.aip.org/Manufacturing/
3.file:///F:/RP/Direct%20Metal%20Deposition.pdf

III B. Tech I Semester

Course Code:

AUTOMATION IN MANUFACTURING

(Professional Elective – I)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Course Objectives:

1. To study the types and strategies and various components in Automated Systems.
2. To understand the automated flow lines, line balancing, material storage and retrieval and inspection.

Course Outcomes:

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

CO1	Understand automation principles, strategies and types of automation.
CO2	Understand methods and equipment's used for inspection in an automated industry.
CO3	Understand transfer lines, automated flow lines and analyze transfer lines with and without buffer storage.
CO4	Solve the assembly line balancing problems in the various flow line systems.
CO5	Understand the different automated material handling, storage and retrieval systems and automated inspection systems.
CO6	Explain adaptive control principles and implement the same online inspection and control.

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	3									
CO3		3	2									
CO4	3	3	2									
CO5	3	3	2									
CO6	3	3	2									

UNIT I

Introduction: Principles and Strategies of Automation, automation in machine tools, mechanical feeding and tool changing and machine tool control, levels of automations-Five levels of automation and control in manufacturing.

Automated Inspection: Fundamentals, types of inspection methods and equipment, Coordinate Measuring Machines, Machine Vision.

UNIT II

Automated Flow Lines: Methods of part transport, transfer mechanism, buffer storage, control function, design and fabrication considerations.

Analysis of automated flow lines – General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines.

Assembly System And Line Balancing: Assembly process and systems, assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT III

Automated Material Handling And Storage Systems:
Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems.
Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.
Automatic Identification Methods-Overview of Automatic Identification Methods, Bar Code Technology, Radio Frequency Identification, Other AIDC Technologies.

UNIT IV

Adaptive Control Systems: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations.
Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

TEXT BOOKS

1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover./ PE/PHI.

REFERENCE BOOKS:

1. Computer Control Of Manufacturing Systems By Yoram Coren.
2. Cad / Cam/ Cim By Radhakrishnan.
3. Automation By W. Buekinsham.

E-RESOURCES:

https://nptel.ac.in/courses/112/103/112103293/

https://nptel.ac.in/courses/112/104/112104288/

III B. Tech I Semester

Course Code:

HYDRAULIC AND PNEUMATIC SYSTEMS

(Professional Elective – I)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites:

Fluid Mechanics and Hydraulic Machinery

Course Objectives:

1. Familiarize on Fluid Power Engineering and Power Transmission System.
2. Introduce the students, the basic concepts of hydraulic and pneumatic systems.
3. Expose the students with various hydraulic and pneumatic actuators.
4. Familiarize on fluid power systems and its applications to real time.
5. Know the problem, which occur in fluid power systems and take necessary troubleshooting/ maintenance activities.
6. Get practiced in designing hydraulic and pneumatic systems.
7. Understand the design procedure available for Hydraulic and Pneumatic circuits.

Course Outcomes:

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

CO1	Explain the concepts of fluid power, its types, advantages, applications of fluid power systems and compare mechanical, electrical, hydraulic and pneumatic systems.
CO2	Explain the basic working principles of the hydraulic pumps and actuators, types of pumps-actuators, explain the design considerations of pumps, actuators and select the valves for hydraulic circuits.
CO3	develop the hydraulic circuits for practical applications, create circuits for various machines, select the size of the accumulators and explain the working principles of safety circuits
CO4	explain the fundamental concepts of pneumatic systems, list the properties of air for pneumatic system, demonstrate on F-R-L unit
CO5	identify various control elements in pneumatic system, develop electro pneumatic and electro hydraulic circuits for robotic applications, design a pneumatic circuit using classic, cascade and step counter methods
CO6	select pneumatic components for installation and maintenance of power packs, explain the architectures of PLC and Microprocessors, develop logical circuits in PLC for automation and determine the faults in fluid power 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	1	2							
CO2	3	2	1	1	2							
CO3	1	3	2	2	1							
CO4	3	3	2	2	1							
CO5	3	3	2	1	2							
CO6	3	3	3	2	1							

UNIT I

Fluid Power Principles And Hydraulic Pumps:

Introduction to fluid power - Types, advantages and application of fluid power systems. Properties of hydraulic fluids terminologies used in fluid power

Basic of Hydraulic and Pneumatic Systems. Comparison of Mechanical, Electrical, Hydraulic & Pneumatic systems for force and motion analysis in automation.

UNIT II

Oil Hydraulic Pumps, Actuators: Introduction-hydraulic actuators-hydraulic cylinders- Types of hydraulic pumps- construction and working principle - design considerations, selection, specifications and characteristics of pumps. Types of actuators-construction and working principle - design considerations, selection, specifications and characteristics of actuators.

Control and Regulation Elements: Direction control valves, Pressure control valves, Flow control valves, Non-return valves, Reservoirs, Accumulators, Heating & cooling devices, Hoses. Selection of valves for hydraulic circuits.

UNIT III

Design of Hydraulic Circuits: Speed control circuits - Regenerative circuits- Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier–Intensifier circuit. - Reservoir design - Selection of components. Hydraulic circuits - Reciprocating - Quick return - Sequencing synchronizing - Safety circuits - Industrial circuits - Press - Milling Machine - Planner - Fork Lift.

UNIT IV

Pneumatic Systems: Pneumatic fundamentals - Properties of air – Compressors – Filter, Regulator, and Lubricator Unit – Air control valves, Quick exhaust valves, and pneumatic actuators. Control Elements - Logic Circuits -Position - Pressure Sensing - Switching – Electro Pneumatic - Electro Hydraulic Circuits - Robotic Circuits.

Design of Pneumatic Circuits: Classic-Cascade-Step counter - Combination -Methods - PLC-Microprocessors -Uses - Selection criteria for Pneumatic components - Installation and Maintenance of Hydraulic and Pneumatic power packs - Fault finding - Principles of Low Cost Automation.

TEXT BOOKS

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2000.
2. Majumdar S.R, "Oil Hydraulics", Tata McGraw Hill, 2000.
3. Majumdar S.R, "Pneumatic Systems – Principles and Maintenance", Tata McGraw Hill, 2001.
4. Introduction to Hydraulics and Pneumatics by S. Ilango and V. Soundararajan, PHI , New Delhi.

REFERENCE BOOKS:

1. Andrew Parr, Hydraulic & Pneumatics, 2/e, Jaico Publishing House Elsevier, 1999.
2. Dudelyt, A. Pease and John T. Pippenger, "Basic Fluid Power", Prentice Hall, 1987
3. Harry L. Stevart D.B, "Practical Guide to Fluid Power", Taraoeala Sons and Port Ltd. Broadey, 1976
4. Oil Hydraulic Systems, S.R .Majumdar, McGrawHill Companies.
5. Pneumatic Systems: Principles and Maintenance, Majumdar, Mc Graw Hill.
6. Applied hydraulics and pneumatics-T. Sunder Selwyn & R. Jayendiran, Anuradha Publications.

E-RESOURCES:

https://www.youtube.com/watch?v=8xd7cWvMrvE

III B. Tech I Semester

Course Code:

ELECTRIC AND HYBRID VEHICLES

(Professional Elective – II)

Lecture – Tutorial:	3-0	Internal Marks:	40
Credits:	3	External Marks:	60

Prerequisites:

Electrical and Electronics Engineering

Course Objectives: The student will

1. Learn about the importance of electric and Hybrid vehicles.
2. Understand working of different configurations of electric vehicles and hybrid vehicles
3. Understand the properties of batteries and its types.
4. Understand the drive systems used in electric and Hybrid vehicles.
5. Recall and understand the fundamentals of power electronics.
6. Learn the concepts of electronics used in hybrid vehicles

Course Outcomes:

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

CO1	Acquire basic knowledge of electric and hybrid vehicles.
CO2	Describe the configurations and working principles of electric and hybrid vehicles.
CO3	Identify the various energy resources used for hybrid vehicles.
CO4	Choose the suitable drive systems for electric vehicles.
CO5	Describe the fundamentals of power electronics.
CO6	Apply the concept of power electronics for hybrid vehicles.

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	1	2										
CO3	1	2										1
CO4	1	2										1
CO5	1	2										
CO6	1	2										1

UNIT I

Introduction to hybrid vehicles- History of electric vehicle, history of hybrid electric vehicle, history of fuel cell vehicle, advantages and limitations, air pollution and global warming, Electric vehicle drive train: EV transmission configurations, transmission components, ideal gearbox, types of hybrid electric vehicles.

UNIT II

Energy sources for hybrid vehicles

Battery: principle and types, Li-ion battery, ultra-capacitor, fuel cells: operating principles of PAFC, PEM, MCFC, SOFC, DMFC, PCFC, ZAFC, Alkaline and Regenerative cells.

UNIT III

Electric machines for hybrid vehicles

Permanent magnet synchronous motor, switched reluctance motor, induction motor, permanent magnet brushless DC motor, regenerative braking system.

UNIT IV

Power electronics for hybrid vehicles: Introduction to digital and Analog Inputs, Basic switches: diode, power transistor, power MOSFET, inverters, charging of hybrid electric vehicle.

TEXT BOOKS

1. Iqbal Husain, ELECTRIC and HYBRID VEHICLES, Design Fundamentals,CRCPress,2003.
2. MehrdadEhsani, YiminGao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
3. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press,2015.

REFERENCE BOOKS:

1. SandeepDhameja, "Electric Vehicle Battery System
2. Rand D.A.J, Woods, R & Dell RM Batteries for Electric vehicles

E-resources:

https://swayam.gov.in/courses/-electric-vehicles

III B. Tech I Semester

Course Code:
MACHINE TOOLS LAB

Lecture – Tutorial- Practical:	0-0-2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites:

Metal cutting and Machine Tools

Course Objectives:

1. To understand the usage of different lab equipment.
2. Know the working principles of different instruments.
3. Familiarize different machine tools used in production floor.
4. Impart hands on experience on different types of lathe
5.To learn the handling of drilling, shaping, milling, slotting,
6. To operate grinding and tool and cutter grinding machines.

Course Outcomes:

Upon Successful Completion of the Course, The Student will be able to:

CO1	Apply The Procedures To Measure Length, Width, Depth, Bore Diameters, Internal And External Tapers, Tool Angles, And Surface Roughness By Using Different Instruments
CO2	Measure Effective Diameter Of Thread Profile Using Different Methods
CO3	Conduct Different Machine Alignment Tests
CO4	Demonstrate Knowledge Of Different Machine Tools Used In Machine Shop
CO5	Perform Step, Taper Turning, Knurling And Threading.
CO6	Produce Stepped Surface Using Shaper And Keyway Using Milling Machine.

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				1	1		
CO2	3		2		2				1	1		
CO3	3		2		2				1	1		
CO4	3		2		2				1	2		
CO5	3		2		2				1	2		
CO6	3		2		2				1	2		

List of Experiments:

1. Introduction of General Purpose Machines
2. Step Turning and Taper Turning on Lathe
3. Thread Cutting and Knurling on Lathe Machine
4. Drilling and Tapping
5. Shaping and Planning
6. Slotting
7. Milling
8. Cylindrical Surface Grinding
9. Grinding of Tool Angle
10. Surface Grinding
11. Wood Turning Lathe
12. CNC Xl Turn
13. CNC Xl Mill

(Any TEN of the above experiments are to be covered)

EQUIPMENT REQUIRED:

Lathe machine, drilling machines, shaping, slotting, turning machines, CNC machines

REFERENCE BOOKS:

1. Manufacturing processes for engineering material-KalpakJain.
2. Materials & processes in Manufacturing-DE Garmo Black Khoser.
3. Manufacturing process, P C Pandey
4 Manufacturing Technology, Vol. 2 Metal Cutting and Machine Tools
May 2013
5. Machining and Machine Tools Paperback A.B. Chattopadhyay (Author)

E-RESOURCES:

http://www.machineryresources.com

III B. Tech I Semester

Course Code:

THEORY OF MACHINES LAB

Lecture – Tutorial- Practical:	0-0-2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

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

III B. Tech II Semester

Course code-
HEAT TRANFER

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

Prerequisites:

Thermodynamics

Course Objectives:

1. Student will be aware of various modes of heat transfer.
2. Student will be exposed to different types of fins.
3. Student will be aware of the concepts related to boundary layer theory and dimensional analysis.
4. Student will know about free and force convection.
5. Student will be in a position to classify heat exchangers.
6. Student will be exposed to the law of radiation.

Course Outcomes:

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

CO1	Explain the basic heat transfer principles.
CO2	Analyze study and unsteady state heat transfer concepts.
CO3	Evaluate the rate of heat transfer from a finned surface.
CO4	Explain convective heat transfer in natural and forced convection for both internal and external flow.
CO5	Apply the concepts of heat transfer in Boiling and Condensation.
CO6	Evaluate the radiation heat exchange between the surfaces and know the significance of radiation shields.

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	
CO2	3	3	2	3	1							
CO3	3	2	3		2							
CO4	2	3		2							1	
CO5	3	3	3		2							
CO6	3	2	3		2						1	

UNIT I

Introduction: Modes and mechanisms of heat transfer – basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier law of heat conduction – General heat conduction equation in cartesian, cylindrical and Spherical coordinates. Steady and Un-steady state heat transfer- initial and boundary conditions, Empirical relations.

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres – electrical analogy – critical radius of insulation- Variable thermal conductivity – systems with heat sources or heat generation.

UNIT II

Extended surface (fins) heat Transfer: Analysis of long fin and short fin with insulated tip- fin efficiency and effectiveness – Application to error measurement of temperature.
One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – lumped heat analysis – significance of biot and fourier numbers - chart solutions of transient conduction systems.
Convective Heat Transfer: Classification of convective heat transfer – significance of non-dimensional numbers – dimensional analysis – Buckingham pi theorem applied to force and free convection.

UNIT III

Forced Convection:
External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -flat plates and cylinders.
Internal Flows: Concepts about hydrodynamic and thermal entry lengths – division of internal flow based on this –use of empirical relations for horizontal pipe flow and annulus flow.
Free Convection: Development of hydrodynamic and thermal boundary layer along a vertical plate – use of empirical relations for vertical plates and pipes.
Heat Transfer With Phase Change:
Boiling: Pool boiling, regimes – Critical heat flux.
Condensation: Film wise and drop wise condensation – laminar film wise condensation on a vertical plate

UNIT IV

Heat Exchangers:
Introduction – Classification of heat exchangers – overall heat transfer coefficient and fouling factor – concepts LMTD and NTU methods – problems.
Radiation Heat Transfer: Introduction – Nature of thermal radiation – absorption, reflection and transmission – concepts of black body – laws of black body radiation – radiation from non black surfaces – emissivity – kirchoff law – radiation heat exchange between two black isothermal surfaces - shape factor – heat exchange between non black infinite parallel plate – radiation shields.

Data Hand Book:
1. C.P. Kothandaraman and Subramanian Heat and Mass Transfer Data Book, New Age International Publications, 7th Edition, Reprint 2012

NOTE: Heat and Mass Transfer Data Hand Book by C.P. Kothandaraman and Subramanian- New Age Publications is to be allowed in Examination.

TEXT BOOKS

1. R.C.Sachdeva - Fundamentals of Engineering Heat and Mass Transfer —New Age Science Publishers, 3rd Edition, 2009.
2. Heat and Mass Transfer /D.S.Kumar / S.K.Kataria& Sons.

REFERENCE BOOKS:

1. Yunus. A. Cengel, Heat & Mass Transfer-A Practical Approach – Tata McGraw Hill, 4th Edition, 2012.
2. M.NecatiOzisik, Heat Transfer- A basic Approach,4th Edition, McGraw-Hill book company, 1985.
3. J.P.Holman, Heat transfer - Tata McGraw-Hill, 9th Edition, 2010.
4. P.K.Nag, Heat and Mass Transfer- TMH 2nd Edition, 2007.

E-RESOURCES:
https://nptel.ac.in/courses/112/101/112101097/

https://www.coursera.org/lecture/thermodynamics-intro/02-04-heat-transfer-gyDfJ

NRI INSTITUTE OF TECHNOLOGY

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An ISO 9001:2015 Certified Institution
Pothavarappadu (V), Agiripalli (M), Eluru District, A.P., India, Pin: 521 212
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

I YEAR I SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A1100101	HSC	Professional Communication	3	-	-	3
2	20A1100201	BSC	Engineering Mathematics-1	3	-	-	3
3	20A1100203	BSC	APPLIED Physics	3	-	-	3
4	20A1103301	ESC	ENGG. GRAPHICS	1	-	-	3
5	20A1105301	ESC	Programming and Problem Solving with C	3	-	-	3
6	20A1100292	BSC	APPLIED Physics Lab	-	-	3	1.5
7	20A1105391	ESC	Programming and Problem Solving with C Lab	-	-	3	1.5
						TOTAL CREDITS =	**18**

Courses offered to other departments by EEE	
Basic Electrical & Electronics Engineering	CE
Basic Civil and Electrical Engineering Workshop	CE

Category	Credits
Basic Science Course	7.5
Engineering Sciences Course	7.5
Humanities and Social Sciences Course	3
TOTAL CREDITS	**18**

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

20A1100201 ENGINEERING MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture – Tutorial:	3-1	**Internal Marks:**	30
Credits:	4	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

CO1	Student will be able to develop the **use** of matrix algebra techniques that is needed by engineers for practical applications (L6) solve system of linear algebraic equations using Gauss elimination, Gauss Seidel and **write** Eigen values and eigenvectors of a matrix (L3)
CO2	Student will be able to **write** diagonal form and different factorizations of a matrix (L3), to find inverse of a matrix and integral powers of a matrix by Cayley-Hamilton Theorem **identify** the nature of a Quadratic form such as positive definite, positive semi definite etc., and use this information to facilitate the calculation of matrix characteristics (L2)
CO3	Student will be able to **evaluate** the approximate roots of polynomial and transcendental equations by different algorithms (L5)
CO4	Student will be able to **apply** Newton's forward & backward interpolation and Lagrange's formulae for unequal intervals (L3)
CO5	Student will be able to **apply** numerical integral techniques to different Engineering problems (L3)
CO6	Student will be able to **apply** different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (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: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss

Elimination method – Eigen values and Eigen vectors and properties.

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT – III: Iterative methods: (8 hrs)

Introduction– Bisection method – Method of false position– Iteration method

Newton-Raphson method (One variable).

Gauss-Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT –V: Numerical integration and Solution of ordinary differential equations with initialconditions (10 hrs)

Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method – Runge-Kutta method (second and fourth order).

TEXT BOOKS:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **David Poole,** Linear Algebra- A modern introduction, 4th Edition, Cengage.

REFERENCE BOOKS:

1. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S.R.K. Iyengar and R.K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press.

E-RESOURCES:1. www.nptel **videos.com/mathematics/(Math Lectures from MIT,Stanford,IIT'S**

2. nptl.ac.in/courses/1221104017

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

I YEAR II SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A1200201	BSC	Engineering Mathematics-II	3	-	-	3
2	20A1200205	BSC	Applied Chemistry	3	-	-	3
3	20A1205302	ESC	JAVA Programming	2	-	-	3
4	20A1202401	ESC	Electrical Circuit Analysis-1	3	1	-	4
5	20A1201301	ESC	Basics of Civil & Mechanical Engineering	3	-	-	3
6	20A1200801	MC	Environmental Sciences	2	-	-	0
7	20A1200191	HSC	Communicative English	-	-	3	1.5
8	20A1200294	BSC	Applied Chemistry LAB	-	-	3	1.5
9	20A1201391	ESC	Basics of Civil & Mechanical Engineering Lab	-	-	3	1.5
10	20A1202491	ESC	Electrical Engineering Workshop	-	-	3	1.5
							TOTAL CREDITS = 22

Courses offered to other departments by EEE	
Basic Electrical & ElectronicsEngineering	MECH
Basic Electrical & ElectronicsEngineering lab	MECH
Basic Electrical Engineering	ECE
Basic Electrical Engineering lab	ECE

Category	Credits
Basic Science Course	7.5
Engineering Sciences Course	13
Humanities and Social Sciences Course	1.5
Mandatory Course	0
TOTAL CREDITS	**22**

Dr. N. SAMBASIVA RAO
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20A1200201 : ENGINEERING MATHEMATICS-II
(Common to All Branches)

Lecture – Tutorial:	3-1	**Internal Marks:**	30
Credits:	4	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

Course Outcomes:

CO1	Student will be able to **find** the General/Particular solutions of first order and first degree ordinary differential equations by **apply** different methods **(L3),** know the applications of Newton's law of cooling, natural growth and decay problems and **find** orthogonal trajectories of the given family of curves. **(L3)**
CO2	Student will be able to **identify** the essential characteristics of linear differential equations with constant coefficients. **(L2)solve** the linear differential equations with constant coefficients by appropriate method **(L3)**
CO3	Student will be able to find convergence (or) divergence of a series **(L3)**
CO4	Student will be able to utilize mean value theorems to real life problems**(L3)**
CO5	Student will be able to find partial derivatives numerically and symbolically and use them to **analyze** and interpret the way a function varies. **(L4)acquire** the Knowledge maxima and minima of functions of several variable **(L1)Utilize** Jacobian of a coordinate transformation to deal with the problems in change of variables **(L3)**
CO6	Student will be able to **find** length of the arc, volume of solid of revolution and surface area of solid of revolution**(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: Differential equations of first order and first degree: (10hrs)

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories.

UNIT-II: Linear Differential equations of higher order: (10hrs)

PHI, second edition.
[2]Yashwant Kanetkar , —"Let us C" , BPB Publications, 2nd Edition 2001.
[3]Paul J. Dietel and Dr. Harvey M. Deitel, —"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
[4]Herbert Schildt, —"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
[5]K.R.Venugopal, Sundeep R Prasad, —"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1.http://cslibrary.stanford.edu/101/EssentialC.pdf
2. http://nptel.ac.in/courses/106104128/
3.http://www.vssut.ac.in/lecture_notes

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

UNIT – III: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's multiplied method.

UNIT – V: Multiple integrals: (8hrs) **(8 hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes

TEXT BOOKS:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **Joel Hass, Christopher Heil and Maurice D. Weir,** Thomas calculus, 14thEdition, Pearson.
3. **Lawrence Turyn,** Advanced Engineering Mathematics, CRC Press, 2013.
4. **Srimantha Pal, S C Bhunia,** Engineering Mathematics, Oxford University Press.

E-RESOURCES:

1. www.nptel **videos.com/mathematics/(Math Lectures from MIT,Stanford,IIT'S**
2. nptl.ac.in/courses/1221104017

20A1200205: APPLIED CHEMISTRY
(Common to EEE and ECE)

Lecture – Tutorial:	3-1	**Internal Marks:**	30
Credits:	4	**External Marks:**	70
Prerequisites:			

Course Objectives:

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

Course Outcomes:

CO1	**Analyze** the different types of composite plastic materials and **interpret** the mechanism of conduction in conducting polymers.
CO2	Predict potential complications from combining various Chemicals, metals in engineering setting and categorize materials science relevant to corrosion phenomena.
CO3	Apply new materials with excellent engineering properties to take care of society needs and environment.
CO4	Analyze the principles of different analytical instrumentation and applications
CO5	Design models for energy by different natural sources
CO6	Understand the knowledge of computational chemistry and molecular 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	3	3	2	-	-	2	-	-	-	-	-
CO2	3	3	2	1	-	-	2	-	-	-	-	-
CO3	3	2	2	-	-	-	2	-	-	-	-	-
CO4	3	3	2	2	-	-	2	-	-	-	-	-
CO5	3	2	2	2	-	-	2	-	-	-	-	-
CO6	3	3	3	3	-	-	3	-	-	-	-	-

UNIT – I: POLYMER TECHNOLOGY

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics:Thermoplastic-Thermosetting, Compounding, fabrication (compression, injection, Transfer and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fibre reinforced plastics, conducting polymers, biodegradable polymers..

Unit – II: ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, liquid Li ion battery), fuel cells (H2-O2).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, factors influencing rate of corrosion, corrosion control method- Protective coatings (Galvanizing, tinning, electroplating and electroless plating [nickel]) .

UNIT – III: MATERIAL CHEMISTRY

Semiconductors: Preparation of semi conductors by zone refining, Czochralski crystal pulling – applications

Super conductors:-Type –I, Type II and applications

Nano materials:- Introduction, sol-gel method & Chemical reduction method of preparation , transmission electron microscopy [TEM], applications of fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

UNIT – IV :SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES

SPECTROSCOPIC TECHNIQUES: Electromagnetic spectrum-UV laws of ab:sorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, applications, FT-IR Basic principle, instrumentation and IR stretching of functional groups (alcohols, carbonyls, amines) applications,

NON-CONVENTIONAL ENERGY SOURCES Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

UNIT –V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies.

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

TEXT BOOKS:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "**A Textbook of Engineering Chemistry**", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

REFERENCE BOOKS:

1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. (a) O.G. Palana, "**Engineering Chemistry**", Tata McGraw Hill Education Private Limited, (2009).
   (b) CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, New York (latest edition)
3. B. S. Murthy, P. Shankar and others, "**Textbook of Nanoscience and Nanotechnology**", University press (latest edition)

E-RESOURCES:

1. https://en.wikipedia.org >wiki> Conductive polymers
2. www.sae.org/fuel cells/fuelcells-types.htm
3. https://en.wikipedia.org >wiki> Nanomaterials
4. https://en.wikipedia.org >wiki> Electrochemical cell
5. https://en.wikipedia.org >wiki> Spectroscopy

20A1205302: JAVA PROGRAMMING

(Common to ECE&EEE)

Lecture – Tutorial-Practical::	2-0-2	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:
C Programming
Course Objectives:
To **introduce** the object oriented programming concepts.
To **understand** object oriented programming concepts, and apply them in solving Problems.
To **introduce** the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
To **introduce** the implementation of packages and interfaces
To **introduce** the concepts of exception handling and multithreading.
To **introduce** the design of Graphical User Interface using applets.
Course Outcomes:
Upon successful completion of the course, the student will be able to:

CO1	Able to **solve** real world problems using OOP techniques.
CO2	Able to **understand** the use of abstract classes and Packages in java.
CO3	Able to **develop** and **understand** exception handling and Interfaces in java
CO4	Able to understand multithreaded applications with synchronization and **design** GUI based applications and **develop** applets for web 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
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	3	3	2	-	-	-	-	2	-	-	3

UNIT I

The History and Evolution of Java: Java's Lineage, Java's Magic: The Byte code, The Java Buzzwords. An overview of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements. Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, Integers, Floating-Point Types, Characters, The Primitive Types, Booleans, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays.

UNIT II

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, A Stack Class. A Closer Look at Methods and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Introducing Access Control, Understanding static, Introducing final, Using Command-Line Arguments.

UNIT III

INHERITANCE: Inheritance basics, Using super keyword, method overriding, Dynamic method dispatch using final with inheritance, abstract classes
Packages: Defining a package, Finding packages and class path, Example, Access protection, importing packages.
Interfaces: Defining Interface, Implementing Interface, Nested Interfaces, Applying interfaces, Variables in interface, Interfaces can be extended.

UNIT IV

Exception handling: Fundamentals, Exception types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions, Creating your own exception subclasses.

Multithreaded Programming: The Java thread model, The Main thread, Creating a thread, creating multiple threads, Using isalive() and Join( ), thread priorities, Synchronization, Inter thread communication.

UNIT V

APPLETS: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets.

Lab Programs:

1. Create a java application that implements the concept of classes and objects.
2. Develop Java Application using inheritance.
3. Use interfaces and develop a java application.
4. Create a package and access members from a package.
5. Develop Java Application using Method overloading and method overriding.
6. Create a java application to copy content from one file to another using IO streams.
7. Develop Java Application to use String and String Buffer classes
8. Implement Exception handling in a given application.
9. Develop java application using Multithreading
10. GUI Application using applets

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

20A1202401: ELECTRICAL CIRCUIT ANALYSIS-1
(Electrical and Electronics Engineering)

Lecture – Tutorial:	3-1 Hours	Internal Marks:	30
Credits	4	External Marks:	70

Prerequisites: This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes single phase circuits, magnetic circuits, network theorems, transient analysis and network topology.

Course Objectives

- To study the concepts of passive elements, types of sources and various network reduction techniques.
- To understand the applications of network topology to electrical circuits.
- To study the concept of magnetic coupled circuit.
- To understand the behavior of RLC networks for sinusoidal excitations.
- To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance.
- To understand the applications of network theorems for analysis of electrical networks.

Course Outcomes

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

CO1	Various electrical networks in presence of active and passive elements.
CO2	Electrical networks with network topology concepts.
CO3	Any magnetic circuit with various dot conventions.
CO4	Any R, L, C network with sinusoidal excitation.
CO5	Any R, L, network with variation of any one of the parameters i.e R, L, C and f.
CO6	Electrical networks by using principles of network theorems.

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	3	2									
CO3	3	3										
CO4	3	2	2									
CO5	3	2										
CO6	3	2	2									

UNIT I

Introduction to Electrical Circuits

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT II

Magnetic Circuits

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic

circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT III

Single Phase A.C Systems

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. node and mesh analysis. Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power .

UNIT IV

Resonance - Locus Diagrams

Series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC, RLC with R, L and C variables.

UNIT V

Network theorems (DC & AC Excitations)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Text Book:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6th edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3rd edition, Hall of India Private Ltd, 2015.

REFERENCE BOOKS:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5th edition, McGraw Hill Education (India), 2013.
2. Linear Circuit Analysis by De Carlo, Lin, 2nd edition, Oxford publications, 2001.
3. Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill, 2017.
4. Electric Circuits by David A. Bell, 7th edition, Oxford publications, 2009.
5. Introductory Circuit Analysis by Robert L Boylestad, 13th edition, Pearson, 2015
6. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthi, 7th edition, DhanpatRai&Co., 2018.

E-RESOURCES

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

20A1201301: Basic Civil and Mechanical Engineering

(Electrical and Electronics Engineering)

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

Prerequisites:

1. Mathematics
2. Physics

Course Objectives:

1. To make the students exposed to the concepts of force and friction, direction and its application & able to demonstrate the basic surveying skills
2. The students are exposed to the concepts of classification of bricks, manufacture of bricks and various aspects of bricks.
3. To introduce the concepts of Soil Types and various aspects of Foundations.
4. To make the students exposed to the Fundamental principles of Thermodynamics.
5. To introduce the concepts of Engineering Materials and Basic manufacturing processes used in manufacturing of products.
6. The students are exposed to the concepts of Engineering Mechanics like analysis of coplanar concurrent systems.

Course Outcomes:

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

CO1	Understand the concepts of force and friction, direction and its application & able to demonstrate the basic surveying skills
CO2	Identify different building materials and their importance in building construction.
CO3	Differentiate brick masonry, stone masonry and types of flooring & roofing and to know about types of soil and foundations.
CO4	Understand the basic concepts of thermodynamics.
CO5	Familiarize with the basic manufacturing processes used in manufacturing of products. F Familiarize with the Engineering materials, their types, properties and applications.
CO6	Analyze coplanar concurrent systems and Familiarize with fundamental principles of thermodynamics.

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	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

UNIT – I

SIMPLE STRESS AND STRAINS:

Definition of Mechanics- External and Internal forces-Stress and Strain-Elasticity and Hooke's Law- Relations between elastic constants.

SURVEYING:

Objectives, Types, Principles of Surveying; Measurement of distances and angles

UNIT II:

CIVIL ENGINEERING MATERIALS:
Classification of bricks, Manufacture of bricks, Laboratory and field tests on bricks, stones; Grades of Steel and Cement Concrete.

MASONRY:
Bonds in Brick Masonry, Stone Masonry; Types of Flooring and Roofing.

UNIT III:

SUB-STRUCTURE: Soil –Types; Introduction to Foundations – Classifications; Bearing capacity of Soil - Improvement

Fundamentals of Thermodynamics: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics.

UNIT-IV

Introduction to Engineering materials: Engineering materials, classification - Properties and applications of Metals: Ferrous and Non-ferrous; Non-metals: Glasses- Ceramics; Polymers: PVC &HDPE.

Basic Manufacturing Processes: Casting: Classification, Steps involved in making a casting - Advantage of casting and its applications. Welding: Classification of welding processes, Fundamental treatment of various welding processes.

UNIT-V

System of forces: Types of Force systems - Coplanar Concurrent Forces - Resultant - Moment of a Force -Resultant of a Force System -Conditions of Equilibrium - Equilibrium analysis of Coplanar Force Systems -Free body diagrams.

TEXTBOOKS:

1. Strength of Materials by R K Bansal, Laxmi publications.
2. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
3. Surveying and levelling, R. Subramanian, Oxford University press
4. Basic Civil Engineering, Palanichamy, M. S, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2002.
5. Thermal Engineering, R.K.Rajput, Laxmi publications.
6. A text book of Material science and metallurgy – O.P. Khanna/ Dhanpat rai publications.
7. Elements of Manufacturing Processes - PARASHAR, B.S. NAGENDRA, MITTAL,
8. Engineering Mechanics – Statics and Dynamics - A. K. Tayal, Umesh Publications.

REFERENCE BOOKS:

1. Building Materials, S. K. Duggal, New Age International Publications
2. Fundamentals of surveying, S.K. Roy – PHI learning (P) ltd.
3. Thermodynamics – An Engineering Approach – YunusCengel& Boles /TMH
4. Engineering Mechanics, SS Bhavikatti& KG Rajasekharappa, New Age International
5. Materials Science and Metallurgy – C. Daniel Yesudian, D. G. Harris Samuel.
6. Production Technology, K.L.Narayana, S.V.Ramana& P. Vamsi Krishna, first edition, I.K. Books
7. Engineering Thermodynamics / PK Nag /TMH International, 2006.
8. Production Technology Vol I, O.P. Khanna & M. Lal, Dhanpat Rai Publicati

20A1200801:ENVIRONMENTAL Sciences
(Common to CE,EEE,ME and ECE

Lecture – Tutorial:	2-0	**Internal Marks:**	30+70
Credits:	--	**External Marks:**	

Prerequisites:

Course Objectives:

The objectives of the course are to impart:

- ❖ Overall understanding of the natural resources.
- ❖ Basic understanding of the ecosystem and its diversity.
- ❖ Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- ❖ An understanding of the environmental impact of developmental activities.
- ❖ Awareness on the social issues, environmental legislation and global treaties.

Course Outcomes:

CO1	➢ Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	➢ Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	➢ Recall the importance of biodiversity and its conservation. (L1)
CO4	➢ Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	➢ Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	➢ Interpret environmental related acts and social issues. (L2)

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	3	2	-	-	2	2
CO2	3	2	2	-	-	2	3	2	-	-	2	2
CO3	3	2	2	-	-	2	3	2	-	-	2	2
CO4	3	2	2	-	-	2	3	2	-	-	2	2
CO5	3	2	2	-	-	2	3	2	-	-	2	2
CO6	3	2	2	-	-	2	3	2	-	-	2	2

UNIT I **(6hrs)**

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids- Ecological succession.

UNIT II **(4hrs)**

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity.

UNIT III **(7hrs)**

Natural Resources: Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT IV **(5hrs)**

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V **(6hrs)**

Social Issues and the Environment: Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics.

TEXT BOOKS:

1) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
2)Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
3) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
4) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

REFERENCE BOOKS:

1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi

E-RESOURCES: 1. http://nptel.ac.in/courses.php.
2. http://intuk-coeerd.in/

20A1200191: Communicative English LAB
(Common to All Branches (CE, EEE, MECH, ECE, CSE, IT, AIML, DS)

Labs / Instructions Hours/Week	3 Hours	**Internal Marks:**	30
Credits	1.5	**External Marks:**	70

PREREQUISITES: None

COURSE OBJECTIVES

1. To learn the sound systems of English and understand word stress of English.
2. To train the students in the art of conversation and discussion
3. To equip the students with good communication skills.
4. To emphasize the need of English in the technical world.
5. To improve their presentation and participation skills
6. To prepare them for interviews and future job environments.

COURSE OUTCOMES

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

CO 1	Demonstrate better understanding of the nuances of spoken English to put into use in various situation and events.
CO 2	Apply the rules of phonetics–pronunciation, accent and intonation– in their everyday communication
CO 3	Relate their understanding of the importance of spoken skills and the need for life-long learning in day-to-day communication.
CO 4	Construct strategies like critical and analytical skills to participate effectively in group discussions and debates.
CO 5	Demonstrate their ideas accurately and effectively in presentations.
CO 6	Build responses to the questions by listening to short audio texts and identify the context and specific pieces of information.

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
CO 1										1		2
CO 2										1		2
CO 3												2
CO 4									1	1		2
CO 5										2		2
CO 6										1		2

UNIT I

- Making Inquiries on the phone, Thanking and Responding to Thanks, Responding to Requests and Asking for Directions
- Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation

UNIT II

- Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating, Apologising, Advising, Suggesting, Agreeing and Disagreeing

- Word stress – Di-Syllabic Words, Poly-Syllabic Words, Weak and Strong Forms, Contrastive Stress (Homographs)

UNIT III

- Debating
- Stress in Compound Words, Rhythm, Intonation, Accent Neutralization.

UNIT IV

- Group Discussions
- Listening to Short Audio Texts, and Identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V

- Presentation Skills and Interview Skills
- Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

Lab Manual: "Infotech English", Maruthi Publications.

Software: k-van solutions Multimedia language lab

REFERENCE BOOKS:

1. **Exercises in Spoken English Part 1,2,3,4,** OUP and CIEFL.
2. **English Pronunciation in use** - Mark Hancock, Cambridge University Press.
3. **English Phonetics and Phonology**-Peter Roach, Cambridge University Press.
4. **English Pronunciation in use**- Mark Hewings, Cambridge University Press.
5. **English Pronunciation Dictionary**- Daniel Jones, Cambridge University Press.
6. **English Phonetics for Indian Students**- P. Bala Subramanian, Mac Millan Publications

E-RESOURCES

1. https://learnenglish.britishcouncil.org/
2. https://rachelsenglish.com/
3. https://www.bbc.co.uk/learningenglish/
4. https://www.engvid.com/
5. https://bbclearningenglish.com

20A1200294 : AppliedChemistry Lab

Labs / Instructions Hours/Week	3	**Internal Marks:**	30
Credits:	1.5	**External Marks:**	70

Prerequisites: Knowledge on Volumetric analysis.

Course Objectives:

- To provide knowledge of chemistry practicals.
- It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
- It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

Course Outcomes:

CO1	Students of Engineering should understand and apply polymers and plastic technologies along with their utilization to solve the problems of the society.
CO2	Knowledge of cells and sensors utilized in many instruments is necessary to engineering students in solving and applying to batteries and fuel cells.
CO3	Knowledge of electrochemical cells is essential in understanding corrosion along with the methods of controlling to budding engineers.
CO4	Students should have the knowledge of water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	Knowledge of fuels and energy, their advantages & disadvantages should be known by the students to solve and understand engineering problems.
CO6	Knowledge, design and analysis of materials should be understood by the Engineering students in solving the complex problems of the society.

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								
CO2	3	3	1	-								
CO3	3	2	2	-								
CO4	3	1	-	1								
CO5	3	2	2	1								
CO6	3	1	1	1								

List of Experiments

1.Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.

2. Determination of HCl using standard Na_2CO_3 solution.
3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
4. Determination of $KMnO_4$ using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard $K_2Cr_2O_7$ solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Preparation of Bakelite.
12. Determination of pH of water sample

EQUIPMENT REQUIRED:

PH meters, Potentiometers, Conductometers, colorimeters.

APPARATUS

Burettes, Pipettes, Conical flask, Beakers, Volumetric flask.

REFERENCE BOOKS:

1 . A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr.JyotsnaCherukuri (2012) *Laboratory Manual of engineering chemistry-II,* VGSTechno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) *Practical Engineering Chemistry,* B.S. Publication

20A1201391: Basic Civil and Mechanical Engineering Lab
(Electrical and Electronics Engineering)

practical	3Hours	**Internal Marks:**	30
Credits:	1.5	**External Marks:**	70

Prerequisites:

Course Objectives:

1) To make the students outline the process of identification of various building components
2) To make the students exposed to the operation of the various survey instruments used for linear measurements.
3) To make the students exposed to the operation of the various survey instruments used for angular measurements.
4)To introduce the concepts of ferrous and Non Ferrous materials
5) To introduce the concepts of primary manufacturing processes.

Course Outcomes:

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

CO1	Understand various survey equipment's like chain, tape, cross-staff and compass
CO2	De Determine distances and irregular areas using conventional survey instruments
CO3	Demonstrate various building materials
CO4	Observe the micro structure of different materials.
CO5	Understand mold preparation
CO6	Design the different types of weld joints and operate the weld 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	3	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	2	1	2	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-
CO5	3	2	1	3	-	-	-	-	-	-	-	-
CO6	3	2	1	3	-	-	-	-	-	-	-	-

List of Experiments

Civil part:

1. Demonstration on usage of chain
2. Ranging – offsets – chain-age
3. To find the area of an irregular polygon using chain by using horizontal measurements
4. Determination of bearings with prismatic compass.
5.Determination of included angles with prismatic compass
6. Demonstration on various Building materials used in construction

Mechanical part:

1. Study of the micro structure of steels.
2. Study of the micro structure of Cast Irons.
3. Mould preparation, Melting and Casting
4. Gas cutting
5. Manual metal arc welding - Lap & Butt Joints
6. Resistance Spot Welding

REFERENCE BOOKS:

1.U.C Jindal and Atish Mozumber, Material science and metallurgy, Pearson education-2012

2.Elements of Manufacturing Processes -, B.S. NAGENDRA PARASHAR, MITTAL

3 .Production Technology Vol I, O.P. Khanna & M. Lal, Dhanpat Rai Publicati

4. A text book of Material science and metallurgy – O.P. Khanna/ Dhanpat rai publications.

5. Laboratory Manual for Basic Civil and Mechanical Engineering workshops

20A1202491: ELECTRICAL ENGINEERING WORKSHOP
(Electrical and Electronics Engineering)

Practical:	3 Hours	**Internal Marks:**	30
Credits	1.5	**External Marks:**	70

Prerequisites: This laboratory introduces the basic concepts of electrical engineering equipment, wiring and safety measures which is the foundation for all labs of Electrical Engineering discipline.

Course Objectives

- To demonstrate the usage of measuring equipment
- To train the students in setting up simple wiring circuits
- To impart methods in electrical machine wiring

Course Outcomes

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

CO1	Explain the limitations of electrical systems and wiring.
CO2	Explain the tolerances of electrical systems and wiring.
CO3	Explain the safety aspects of electrical systems and wiring.
CO4	. Select wires/cables and other accessories used in different types of wiring.
CO5	Make simple lighting and power circuits.
CO6	Measure current, voltage and power in a circuit

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	3	2						1			
CO4	3	3	2						1			
CO5	3	3	2						1			
CO6	3	3	2						1			

List of Experiments

Any 10 of the following experiments are to be conducted:

1 . Study of various electrical tools and symbols.

2. Study various types of electrical cables/wires, switches, fuses, fuse carriers, MCB, ELCB, RCCB and MCCB with their specifications and usage.

3. Soldering and de-soldering practice.

4. Identification of various types of resistors and capacitors and understand the usage digital multi-meter.

5. Identification of various semiconductor devices.

6. Study of Moving Iron, Moving Coil, Electrodynamic and Induction type meters.
7. Fluorescent lamp wiring.
8. Wiring of lighting circuit using two way control.(stair case wiring)
9. Godown wiring/ Tunnel wiring
10. Hospital wiring.
11. Measurement of voltage, current, power in DC circuit.
12. Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter for calculating Power and Power Factor.
13. Measurement of earth resistance.
14. Wiring of backup power supply for domestic Installations including inverter, battery and load.
15. Troubleshooting of domestic electrical equipment's (tube light and fan).
16. Understand the usage of CRO, function generator. & Regulated power supply and Measurement of ac signal parameters using CRO.
17. Assembling electronic components on bread board.
18. Obtain V-I characteristics of Light Emitting Diode

REFERENCE BOOKS:

1.U.C Jindal and Atish Mozumber, Material science and metallurgy, Pearson education-2012

2.Elements of Manufacturing Processes -, B.S. NAGENDRA PARASHAR, MITTAL

3 .Production Technology Vol I, O.P. Khanna & M. Lal, Dhanpat Rai Publicati

4. A text book of Material science and metallurgy – O.P. Khanna/ Dhanpat rai publications.

NRI INSTITUTE OF TECHNOLOGY

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

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III 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	18A3102401	Electrical Measurements	3	-	-	3	40	60	100	3
2	18A3103401	Switching Theory and Logic Design	3	-	-	3	40	60	100	3
3	18A3102402	Power Systems-II	3	-	-	3	40	60	100	3
4	18A3102403	Power Electronics	3	-	-	3	40	60	100	3
5	18A3102601 18A3102602	**OE-II** 1) Renewable Energy Sources 2) Modeling & Simulation of Systems	3	-	-	3	40	60	100	3
6	18A3102491	Electrical Machines-II Lab	-	-	3	3	40	60	100	1.5
7	18A3102492	Power Electronics Lab	-	-	3	3	40	60	100	1.5
8	18A3102493	Electrical Measurements Lab	-	-	3	3	40	60	100	1.5
9	18A3100802	Indian Constitution	2	-	2	2	-	-	-	-
Total			**17**	**-**	**11**	**26**	**360**	**540**	**900**	**19.5**

III 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	18A3202401	Power Electronic Controllers & Drives	3	-	-	3	40	60	100	3
2	18A3202402	Instrumentation	3	-	-	3	40	60	100	3
3	18A3202403	Power System Analysis	3	-	-	3	40	60	100	3
4	18A3202301	Microprocessor & Microcontrollers	3	-	-	3	40	60	100	3
5	18A3202401	Utilization of Electrical Energy	3	-	-	3	40	60	100	3
6	18A3202601	**OE-III:** Management Science Python Programming	3	-	-	3	40	60	100	3
7	18A3202491	Electrical Simulation Lab	-	-	3	3	40	60	100	1.5
8	18A3202391	MPMC Lab	-	-	3	3	40	60	100	1.5
9	18A3202791	Mini Project	-	-	-	-				1
Total			**18**	**-**	**8**	**26**	**360**	**540**	**900**	**22**

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 (NRI)

ELECTRICAL MEASUREMENTS

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60
Prerequisites:			
ELECTRICAL CIRCUITS, ELECTRO MAGNETIC FIELDS,ELECTRICAL MACHINES, POWER SYSTEMS			
Course Objectives:			
1. Familiar with various measuring instruments used to detect electrical quantities. 2. Design and test instrument transformers for various electrical applications. 3. Measuring the most common physical quantities. 4. Measure electrical parameters using AC and DC bridges.			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	List the various measuring instruments available.
CO2	Compare various electrical quantities and measure them.
CO3	Design various instrument transformers.
CO4	Test various instrument transformers.
CO5	Design and Measure the passive elements R, L and C by using various bridges.
CO6	Design the Digital meters and measure the electrical parameters.

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	1	2									
CO2	2	3							2			
CO3	3	3	2									
CO4	2	2	2						2			
CO5	3	2	2									
CO6	2	2										

UNIT I

Measuring Instruments

Classification, deflecting, control and damping torques, Ammeters and Voltmeters, PMMC, moving iron type instruments, expression for the deflecting torque and control torque ,Errors and compensations. Extension of range using shunt and series resistance.

Measurement of Power and Energy

Single phase and three phase dynamometer wattmeter, LPF and UPF, expression

for deflecting and control torques, Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter, driving and braking torques, errors and compensations, testing by phantom loading using R.S.S. meter, Three phase energy meter, Trivector meter, maximum demand meters.

UNIT II

Instrument Transformers

Current Transformers, Theory, Ratio error and phase angle error. Potential Transformers - Theory, Ratio error and phase angle error.

Special Meters

Type of P.F meters-Single phase Electrodynamometer Power Factor meter-three phase Electrodynamometer . Type of Frequency meters – Mechanical Resonance type Frequency meter, Electrical Resonance type Frequency meter-Weston type Frequency meter-Ratio meter type Frequency meter, Saturable core Frequency meter.

UNIT III

Resistance Measurements

Method of measuring low, medium and high resistances, sensitivity of Wheat stone's bridge, Carey Foster's bridge- Kelvin's double bridge for measuring low resistance, loss of charge method for measurement of high resistance.

A.C. Bridges

Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owens's bridge. Measurement of capacitance and loss angle, Desauty Bridge, Wien's bridge, Schering Bridge.

UNIT IV

Digital meters

Introduction to digital meters, Digital Voltmeters-Successive approximation, ramp and integrating type, Digital frequency meter, Digital energy meters and Digital tachometer- Bidirectional meters accuracy class.

TEXT BOOKS:

1.A course in Electrical and Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & Co. Publications.

2. Electrical Measurements and measuring Instruments,E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing company.

3. Modern Electronic Instrumentation and Measurement Techniques, Albert D. Helfrick and William D. Cooper, PHI, 2nd Edition.

REFERENCE BOOKS:

1.Principles of Electrical Measurements, H.Buckingham and Price, Prentice, Hall India.

2. Electrical Measurements, Forest Klaire Harris, John Wiley and sons.

3. Electrical Measurements: Fundamentals, Concepts, Applications, Martin.U.Reissland, New Age International Publishers Limited.

4. Electrical and Electronic Measurements, G.K.Banerjee, PHI Learning Private

Ltd.
E-RESOURCES:
http://nptel.ac.in/syllabus/108106070/

SWITCHING THEORY AND LOGIC DESIGN

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

Prerequisites:

MATHEMATICS,CIRCUITS

Course Objectives:

- To introduce the basic concepts of binary codes, error detecting and correcting codes.
- To study the representation of switching functions using Boolean expressions and their minimization techniques.
- To design and realize various combinational circuits, synchronous and asynchronous sequential logic circuits.
- To analyze various synchronous and asynchronous sequential logic circuits.

Course Outcomes:

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

CO1	Identify the features of various number systems.
CO2	Identify the features of various binary codes.
CO3	Apply the concepts of Boolean algebra for the analysis
CO4	Design of various combinational & sequential logic circuits.
CO5	Design various digital circuits starting from simple ordinary gates to complex programmable logic devices & arrays.
CO6	Analyze various synchronous and asynchronous sequential circuits.

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	2	3	3									
CO3	2	3	3							1		
CO4	2	3	3							3		
CO5	2	3	3							2		
CO6	2	3	3									

UNIT I

Number Systems and Binary Codes:
Philosophy of number systems, complement representation of negative numbers, binary arithmetic, binary codes, error detecting & error correcting codes –Hamming codes.
Boolean algebra: Fundamental postulates of Boolean algebra, Basic theorems and properties.

UNIT II

Switching Functions: Switching functions- Canonical and Standard forms, Algebraic

simplification, Digital logic gates, Multilevel NAND/NOR realizations, Minimization of switching functions using K-Map up to 5-variables, Tabulation Method, Prime Implicant chart.
UNIT III
Combinational Logic Circuits: Adders, subtractors, multiplexers and de-multiplexers, decoders and encoders, code converters, 1 Bit ALU **Sequential logic:** 1-bit memory cell, SR, JK, D and T flip-flops level triggering and edge triggering, conversions of Flip-Flop.
UNIT IV
Synchronous Sequential Machines: Finite state machines, Mealy and Moore models, Analysis of Clocked Sequential circuits, Design procedures, State reduction and State assignment, Design and realization of circuits using various Flip-flops.
TEXT BOOKS:
Switching and Finite Automata theory, ZviKohavi and Niraj k Jha, Cambridge University Press, 3rd edition, 2010.
REFERENCE BOOKS:
1. Digital Design, Morris Mano, PHI, 3rd Edition, 2001. 2. Fundamentals of Logic Design, Charles H. Roth, Thomson Publications, 5th Edition, 2009.
E-RESOURCES:
1. http://www.ece.ubc.ca/~saifz/eece256.htm 2.http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Guwahati/digital_circuit/frame/index.html

POWER SYSTEMS II

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

Prerequisites:

Power Systems-I Concepts and Calculus

Course Objectives:

The Objectives of learning this Course are:

- To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
- To study the short and medium length transmission lines, their models and performance
- To study the factors affecting the performance of transmission lines and compensation methods
- To study the performance and modeling of long transmission lines.
- To study the effect of travelling waves on transmission lines.
- To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.

Course Outcomes:

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

CO1	Derive transmission line parameters for analyzing the behavior under different operating conditions.
CO2	Analyze the performance of short & medium transmission lines.
CO3	Analyze the performance of long transmission lines.
CO4	Understand the surge propagation, reflection and refraction in transmission lines and design the level of insulation coordination at various high voltages.
CO5	Utilize the knowledge on surge behavior of transmission line for protection of power equipment
CO6	Formulate physical and geometrical parameters of transmission line useful for its safe and efficient performance.

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	2									
CO3		3	2									
CO4		2										
CO5				3	2							
CO6		2	2									

UNIT I - TRANSMISSION LINE PARAMETERS

SERIES PARAMETERS OF TRANSMISSION LINES:

Conductor materials – Types of conductors : Solid, Stranded, Composite Stranded, Hollow Conductor Configurations: Bundled, Double Circuit & Parallel Line – Skin and Proximity effects: Description and effect on Resistance of Solid Conductors - Calculation of resistance for solid conductors –Calculation of inductance for single phase and three phase– Single and double circuit lines–Self & Mutual GMD – Symmetrical and asymmetrical conductor configuration with
and without transposition - Numerical Problems

SHUNT PARAMETERS OF TRANSMISSION LINES:

Ferranti effect – Charging Current - Capacitance calculations for single and three phase – Single and double circuit lines with symmetrical and asymmetrical configurations–Numerical Problems.

UNIT II – PERFORMANCE OF TRANSMISSION LINES

CORONA & COMPENSATION:

Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference & Induced EMF in communication lines – Static Compensation: Series & Shunt capacitor and Series & Shunt Inductor – Dynamic Compensation: Synchronous capacitor/inductor & Synchronous Phase Modifier.

SHORT & MEDIUM TRANSMISSION LINES:

Classification of Transmission Lines – Short, medium, long line and their model Representations – A B C D Constants, regulation and efficiency of Short line, Sending End Capacitance – Receiving End Capacitance - Nominal-T–Nominal-□ models – Numerical Problems - Zero & Maximum Voltage Regulation of Short Line.

UNIT III – TRANSIENTS IN LONG TRANSMISISION LINES

LONG TRANSMISSION LINES:

Rigorous Solution for Evaluation of A,B,C,D Constants of Long Transmission Line – Representation of Long Lines – Equivalent-T and Equivalent Pie network models - Interpretation of the Long Line Equations, regulation and efficiency– Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves –Numerical Problems.

POWER SYSTEM TRANSIENTS:

Types of System Transients – Travelling or Propagation of Surges – Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions.

UNIT IV – SAG AND INSULATORS

SAG & TENSION CALCULATIONS:

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and
Ice on weight of Conductor–Numerical Problems

INSULATORS & STRING EFFICIENCY:

Types of Insulators – String efficiency and Methods for improvement–Numerical

Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

TEXT BOOKS:

1. A course in Electrical Power systems, J.B. Gupta, Kataria Publications.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand & Company Ltd.New Delhi 2004.

REFERENCE BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Modern Power System Analysis by I.J. Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh, PHI, 2003.

E-RESOURCES:

1. https://nptel.ac.in/courses/108105104/
2. https://nptel.ac.in/courses/108/105/108105067/

POWER ELECTRONICS

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

Prerequisites:

- Knowledge of Laplace Transforms **[Mathematics]**
- Knowledge of Fourier Analysis & Differential Equations **[Mathematics]**
- Basic concepts of KVL **[Electric Circuits]**
- Basic concepts of transistors and diodes **[Electronic Devices & Circuits]**

Course Objectives:

- To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
- To understand the operation of single phase full–wave converters and analyse harmonics in the input current.
- To study the operation of three phase full–wave converters.
- To understand the operation of different types of DC-DC converters.
- To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
- To analyse the operation of AC-AC regulators.

Course Outcomes:

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

CO1	Demonstrate basic theory of operation of SCR, characteristics of power MOSFET & power IGBT and to design protection & Firing circuits.
CO2	Explore and interpret 1-□ Half Wave, Full wave converters, with the effect of source inductance and input harmonics.
CO3	Analyze various 3-□ uncontrolled & controlled rectifier circuits and Understand their Applications
CO4	Analyze & design various BUCK,BOOST & BUCK – BOOST converters in different modes with ripple calculation & operation of different modes with ripple calculation & operation of fly back converter
CO5	Analyze steady –state performance of 1-□ & 3-□ inverters & applications of PWM techniques ,operation of VSI & CSI
CO6	Analyze the operation of 1-□ & 3-□ AC – AC Regulators, Static V-I characteristics of TRAIC & operation of Tap changing Transformer with Anti-parallel connection of Thyristors

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	3	3	3	0	0	0	0	0	0	0	0	0
CO4	3	2	1	0	1	0	0	1	0	0	0	1
CO5	3	3	3	0	0	1	3	1	0	0	0	1
CO6	2	2	1	0	0	0	0	1	0	0	0	0

UNIT I

Power semiconductor& switching devices: Power electronic devices- Introduction, characteristics of ideal switch, real switch, V-I characteristics of power diodes, Silicon Controlled Rectifier (SCR), Metal Oxide Semiconductor Field Effect Transistor(MOSFET) and Insulated Gate Bipolar Transistor (IGBT), two transistor model of SCR, turn ON methods of SCR, turn OFF methods of SCR (voltage commutation), snubber protection for SCR, quadrant operation of power semiconductor devices, GATE drive circuits for MOSFET/IGBT.

UNIT II

AC to DC converters: Introduction, single phase fully controlled bridge rectifier with R, pure inductor, RL and RLE loads-effect of source inductance performance parameters of converters.

Three Phase Converters: Three phase uncontrolled and fully controlled bridge converters with R, RL loads-performance parameters of converters.

UNIT III

AC to AC Regulators: Introduction-single phase two SCRs in anti- parallel– with R and RL loads–derivation of RMS load voltage, current and power factor.

DC to DC converters: Introduction, Chopper classification, time ratio control, buck converter, boost converter, buck-boost converters – Voltage and Current ripple calculations and design of L & C for all converters.

UNIT IV

DC to AC converters: Introduction, single phase full bridge inverters, comparison between VSI & CSI, three phase VSI (180 &120 degree conduction modes).

Voltage control techniques for inverters: Pulse-width modulation techniques - single pulse, multi-pulse, sinusoidal pulse width modulation techniques.

TEXT BOOKS:

1. Power Electronics by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics : Circuits, Devices and Applications by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
3. Power Electronics: converters, applications & design by Nedmohan, Tore M. Undeland, Riobbins by Wiley India Pvt. Ltd.
4. Power Electronics MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company, 1998.

REFERENCE BOOKS:

1. Power Electronics by Vedam Subramanyam, New Age International (P) Limited.
2. Power Electronics by V.R.Murthy , 1st edition -2005, OXFORD University Press
3. Power Electronics by P.C.Sen,Tata Mc Graw-Hill Publishing.
4. Thyristorised Power Controllers by G. K. Dubey, S. R. Doradra, A. Joshi and R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.

E-RESOURCES:

[1]. www.nptel.ac.in/courses/108101038/

INDIAN CONSTITUTION

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

Prerequisites:

NIL

Course Objectives:

- To create awareness among students about the Indian Constitution.
- To create consciousness in the students on democratic values and principles articulated in the constitution.
- Gain consciousness on the fundamental rights and duties.
- Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

Course Outcomes:

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

CO1	Understand the spirit and origin of the fundamental law of the land.
CO2	Understand how fundamental rights can be protected and understand the fundamental duties .
CO3	Understand the structure and formation of the Indian Government at center as well as state.
CO4	Understand when and how an emergency can be imposed and its consequences.

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												
CO2												
CO3												
CO4												
CO5												
CO6												

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 **Evolution**:1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

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, Directive principles, Fundamental Duties

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*l, 1st Edition, 2015.
REFERENCE BOOKS:
1.M. P. Jain, □*Indian Constitution Law*l, 7th Edition., Lexis Nexis, 2014. 2.D.D. Basu, □*Introduction to the Constitution of Indi*al, Lexis Nexis, 2015. 3. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi 4. Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi 5. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi
E-RESOURCES:

RENEWABLE ENERGY SOURCES

(Open Elective-II)

Lecture – Tutorial:	3 - 0	**Internal Marks:**	40
Credits:		**External Marks:**	60

Course Objectives:

- It introduces basics of solar energy like solar radiation, collection, storage and application.
- It also introduces the wind energy, biomass energy, geothermal energy and ocean energy as alternative energy sources.

Course Outcomes:

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

CO1	Apply knowledge of mathematics physics and engineering to the analysis and design of renewable energy systems.
CO2	Identify, formulate, and solve engineering problems in the area of renewable energy system for clean, reliable and efficient electrical power
CO3	Design an electric system, or process to meet desired needs within realistic constraint for wind, solar thermal, solar PV systems.
CO4	Design an electric system, or process to meet desired needs within realistic constraint for bio mass geothermal and ocean energy systems.
CO5	Get the knowledge on modern issues in electrical power generation.
CO6	Get the ability to function effectively on multidisciplinary teams.

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	2									
CO2	3	3	3									
CO3	2	2	2									
CO4	3	2										
CO5	2	3	2									
CO6	2	3	2									

UNIT I

Principles of Solar Radiation and Solar Energy Collection

Role and potential of new and renewable source, the solar energy option, environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data. Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT II

Solar Energy Storage, Applications and Photovoltaic Energy Conversion

Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications solar heating/cooling technique, solar distillation and drying. Solar cell fundamentals, solar cell classification, performance of solar cell- power from solar module.

UNIT III

Wind Energy and Bio-Mass

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria. Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

UNIT IV

Energy and Ocean Energy

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.

Energy Conversion

Principles DEC, MHD generators, principles, MHD power generation systems. Fuel cells, principles, of fuels and operating conditions, merits and demerits of different types of fuel cells, mini-hydel power plants and their economics.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna publishers, 5th edition,2014.
2. Renewable Energy resources, Tiwari and Ghosal, Narosa,2005
3. Science and Technology of Photo Voltaics by Jayarama Reddy, BS publications, 2nd edition,2012

REFERENCE BOOKS:

1. Non-Conventional Energy by Ashok V Desai, New age, 2005.
2. Non-Conventional Energy Sources by B.H.Khan, Tata Mc Graw-hill Publishing Company, 2nd edition,2013.

E- RESOURCES

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

MODELING & SIMULATION OF SYSTEMS

(Open Elective-II)

Lecture – Tutorial:	3 - 0	Internal Marks:	40
Credits:		External Marks:	60

Course Objectives:

- Presents the basic knowledge on simulation Terminologies.
- Gives immense knowledge on discrete and continuous components.
- Explains about Stastical models and Random Number Generation.
- Improves Knowledge on model building techniques.

Course Outcomes:

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

CO1	Understand about the simulation terminologies.
CO2	Understand about the discrete components.
CO3	Have the knowledge in Stastical models in simulation.
CO4	Understand the properties of Random Number Generation.
CO5	Test the Random Number Generation.
CO6	Analyze the Model Building of various models.

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	2									
CO2	3	3	3									
CO3	2		2									
CO4	3		3							2		
CO5	2	3	2							2		
CO6	2	3	2									

UNIT I

Introduction – Simulation Terminologies- Application areas – Model Classification –Types of Simulation- Steps in a Simulation study- Concepts in Discrete Event Simulation– Simulation Examples

UNIT II

Statistical Models in Simulation :Review of terminology and concepts, Useful statistical models, Discrete distributions. Continuous distributions, Poisson process, Empirical distributions.

UNIT III

Random-Number Generation: Properties of random numbers; Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers.
UNIT IV
Model Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.
TEXT BOOKS:
1. Jerry Banks and John Carson, " Discrete Event System Simulation", Fourth Edition,PHI, 2005. 2. Geoffrey Gordon, "System Simulation", Second Edition, PHI, 2006 (Unit – V).
REFERENCE BOOKS:
1. Frank L. Severance, " System Modeling and Simulation", Wiley, 2001. 2. Averill M. Law and W.David Kelton, " Simulation Modeling and Analysis, Third Edition, McGraw Hill, 2006. 3. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley, 1998.
E-RESOURCES:
1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

ELECTRICAL MACHINES-II LAB

Lecture – Tutorial:	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			
Electrical Machines-I and Electrical Machines-II			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Understand the performance of three phase induction motors.
CO2	Control the speed of three phase induction motors.
CO3	Improve the power factor of single phase induction motor .
CO4	Improve the power factor of single phase induction motor .
CO5	Obtain the Equivalent Circuits.
CO6	Predetermine the regulation of three–phase alternator by various methods, find X_d/X_q ratio of alternator and asses the performance of three–phase synchronous motor.

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	3	3	3	0	0	0	0	0	0	0	2	0
CO4	3	2	1	0	1	0	0	1	0	0	2	0
CO5	3	3	3	0	0	2	3	1	0	0	0	1
CO6	2	2	1	0	0	0	0	1	0	0	0	0

The following experiments are required to be conducted as compulsory experiments:

1. Brake test on three phase Induction Motor.
2. No–load & Blocked rotor tests on three phase Induction motor.
3. Regulation of a three –phase alternator by synchronous impedance & m.m.f. Methods.
4. Regulation of three–phase alternator by Potier triangle method.
5. V and Inverted V curves of a three—phase synchronous motor.
6. Determination of X_d and X_q of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor.
8. Speed control of induction motor by V/f method.
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 and load test on single phase induction motor.

POWER ELECTRONICS LAB

Lecture – Tutorial:	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			
Power Electronics			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT.
CO2	Analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
CO3	Understand the operation of single phase AC voltage regulator.
CO4	Understand the working of Buck converter, Boost converter, single–phase square wave inverter and PWM inverter.
CO5	Understand the operation of resistive and inductive loads.
CO6	Understand the operation of various rectifiers and inverters.

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	3	3	3	0	0	0	0	0	0	0	2	0
CO4	3	0	1	0	1	0	0	1	0	0	2	0
CO5	3	3	0	0	0	2	3	1	0	0	0	1
CO6	2	0	1	0	0	0	0	1	0	0	0	0

Any 10 of the Following Experiments are to be conducted

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Regulator with R and RL Loads
7. Single -Phase square wave bridge inverter with R and RL Loads
8. Three- Phase fully controlled converter with RL–load.
9. Design and verification of voltages gain of Boost converter in Continuous Conduction Mode(CCM) and Discontinuous Conduction Mode(DCM).
10. Design and verification of voltages ripple in buck converter in CCM operation.
11. Single -phase PWM inverter with sine triangle PWM technique.
12. 3-phase AC-AC voltage regulator with R-load.

ELECTRICAL MEASUREMENTS LAB

Lecture – Tutorial:	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			
Electrical Measurements			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Measure the electrical parameters voltage, current,
CO2	Test transformer oil for its effectiveness.
CO3	Measure the parameters of inductive coil.
CO4	Measure the electrical parameters power, energy and
CO5	Measure the electrical characteristics of resistance, inductance and capacitance
CO6	Measure the Quality Factor and Dissipation Factors

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	2	3	3	0	0	0	0	0	0	0	2	0
CO4	2	0	1	0	1	0	0	1	0	0	2	0
CO5	3	0	0	0	0	2	3	1	0	0	0	1
CO6	2	0	1	0	0	0	0	1	0	0	0	0

Any 10 of the following experiments are to be conducted

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering bridge.
6. Inductance Measurement using Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3 phase power with single watt meter.
10. Calculation of Turns Ratio using AC Bridge.
11. Calibration of Electro dynamometer type PF Meter.
12. Dielectric oil testing using H.T test Kit.
13. Calibration of AC voltmeter and measurement of choke parameters using AC Potentiometer in polarform.
14. Measurement of Power by 3 Voltmeter and 3 Ammeter method.

POWER ELECTRONIC CONTROLLERS & DRIVES

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

Prerequisites:

- Knowledge of Laplace Transforms **[Mathematics]**
- Knowledge of **Electric Circuits , Power Electronics, Electrical Machines**
- Basic concepts of transistors and diodes **[Electronic Devices & Circuits]**

Course Objectives:

1. Learn electric drive system and multi quadrant operation
2. Understand operation of 1□, 3□ rectifiers fed DC motors
3. Understand operation of chopper fed DC motors
4. Know the speed control of converter fed Induction motor and Synchronous motor

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Learn the fundamentals of electric drive and different electric braking methods.
CO2	Analyse the operation of three phase converter controlled dc motors and four Quadrant operation of dc motors using dual converters.
CO3	Discuss the converter control of dc motors in various quadrants
CO4	Understand the concept of speed control of induction motor by using AC voltage Controllers and voltage source inverters.
CO5	Learn the principles of static rotor resistance control and various slip power recovery schemes
CO6	Understand the speed control mechanism of synchronous 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 1
CO1	3	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	3	3	3	0	0	0	0	0	0	0	2	0
CO4	3	2	1	0	1	0	0	1	0	0	2	0
CO5	3	3	3	0	0	2	3	1	0	0	0	1
CO6	2	2	1	0	0	0	0	1	0	0	0	0

UNIT I

Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.

Controlled Converter Fed DC Motor Drives

1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics — Principle of operation of dual converters and dual converter fed DC motor drives -Numerical problems.

UNIT II

DC–DC Converters Fed DC Motor Drives

Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excitedDC motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operation – Closed loop operation (qualitative treatment only).

UNIT III

Stator side control of 3-phase Induction motor Drive

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor byPWMvoltage source inverter – Closed loop v/f control of induction motor drives (qualitative treatment only).

Rotor side control of 3-phase Induction motor Drive

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT IV

Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (qualitative treatment only).–Variable frequency control–Pulse width modulation.

TEXT BOOKS:

1. Fundamentals of Electric Drives – by G K DubeyNarosa Publications
2. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

REFERENCE BOOKS:

1.Electric Motors and Drives Fundamentals, Types and Apllications, by Austin Hughes and Bill Drury, Newnes.
2.Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw

Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

E-RESOURCES:

1. www.siemens.com/Sirius
2. www.minglebox.com
3. www.abb.com
4. www.drives-and-controls.co.uk
5. http://nptel.ac.in/courses/108102046

INSTRUMENTATION

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

Prerequisites:

ELECTRICAL CIRCUITS, ELECTRO MAGNETIC FIELDS,ELECTRICAL MACHINES, POWER SYSTEMS

Course Objectives:

Focuses on imparting the principles of measurement which includes the working mechanism of various sensors and devices, that are in use to measure the important physical variables of various mechatronic systems.

Course Outcomes:

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

CO1	Understand the Basic principles of measuring systems.
CO2	Measure the Temperature and its ranges.
CO3	Measure of Level and Flow Rate
CO4	Measure Stress and design various stress measuring devices.
CO5	Measure the Force, Torque and Power by using various meters.
CO6	Study and Design various Transducers

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									
CO2	2	2	2									
CO3	3	3	2									
CO4	3	3	2									
CO5	3	3										
CO6	3	3										

UNIT I

Basic principles of measurement – measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. dynamic performance characteristics – sources of error, classification and elimination of error.

Measurement of temperature:Classification – ranges – various principles of measurement – expansion, electrical resistance – thermistor – thermocouple – pyrometers – temperature indicators.

UNIT II

Measurement of pressure:Units – classification – different principles used.

manometers, piston, bourdon pressure gauges, bellows – diaphragm gauges.
Measurement of level: Direct method – indirect methods – capacitative, ultrasonic, magnetic.
Flow measurement:Rotameter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, laser doppler anemometer (LDA).

UNIT III

Stress strain measurements: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge rosettes.
Oscilloscope:CRO-Time Base Generator-Horizontal and Vertical amplifiers-Lissajous Patterns-Sampling Oscilloscope-Analog and Digital type Data logger-Transient Recorder.

UNIT IV

Measurement of force, torque and power- Elastic force meters, load cells, torsion meters, dynamometers.
Signal Analysers-Wave Analysers-Harmonic Analysers-Basic Spectrum Analysers
Transducers: Principles of transducers, Thermistors, Thermo couples, Strain Gauge and Linear Variable Differential Transformers.

TEXT BOOKS:

1.A course in Electrical and Electronic Measurements & Instrumentation, A.K. Sawhney, Dhanpat Rai & Co. Publications.
2. Electrical Measurements and measuring Instruments,E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing company.
3. Modern Electronic Instrumentation and Measurement Techniques, Albert D. Helfrick and William D. Cooper, PHI, 2nd Edition.

REFERENCE BOOKS:

1.Measurement Systems: Applications & design by D.S Kumar.
2.Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE.

E-RESOURCES:

http://nptel.ac.in/syllabus/

POWER SYSTEMS III

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

IC APPLICATIONS

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

Course Objectives:

- To understand the basic operation &performance parameters of differential amplifiers.
- To understand & learn the measuring techniques of 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 opamps
- To learn the internal structure, operation and applications of different analog ICs
- To Acquire skills required for designing and testing integrated circuits

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Design circuits using operational amplifiers for various applications.
CO2	Analyze and design amplifiers and active filters using Op-amp.
CO3	Diagnose and trouble-shoot linear electronic circuits.
CO4	Understand the gain-bandwidth concept.
CO5	Understand the frequency response of the amplifier configurations.
CO6	Understand thoroughly the operational amplifiers with linear integrated circuits.

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			1		3			2				
CO2			2		1			2				
CO3			3	1								
CO4	2		1	2								
CO5		1	1									2
CO6	1		2									3

UNIT I

Part I

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced outputConfiguration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single EndedInput – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

Part II

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, DC and AC characteristics,741 op-amp & its features, Op-Amp parameters & Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

UNIT II

Part I

LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier,Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators,

Part II

NON-LINEAR APPLICATIONS OF OP-AMPS

Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.

UNIT III

Part I

ACTIVE FILTERS, : Design & Analysis of Butterworthactive filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.

Part II

ANALOG MULTIPLIERS AND MODULATORS

Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.

UNIT IV

Part I

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astableoperations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL

Part II

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques,weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

REFERENCE BOOKS:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria&Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd.
4. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin& Fredrick Driscoll, PHI, 6th Edition.
5. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition

E-RESOURCES:

UTILIZATION OF ELECTRICAL ENERGY

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

Course Objectives:

This course primarily deals with utilization of electrical energy generated from various sources. Electric heating, welding and illumination are some important loads in the industry in addition to motor/drives. Another major share of loads is taken by Electric Traction. Utilization of electrical energy in all the above loads is discussed in detail in this course. Demand side management concepts are also introduced as a part of this course.

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	To acquaint with the different types of heating techniques.
CO2	Demonstrate the concepts of electric welding.
CO3	To study the basic principles of illumination and its measurement.
CO4	To understand different types of lightning system including design.
CO5	To understand the basic principle of electric traction including speed–time curves of different traction services.
CO6	To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management of energy.

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			1		3			2				
CO2			2		1			2				
CO3			3	1								
CO4	2		1	2								
CO5		1	1									2
CO6	1		2									3

UNIT I

Electric Heating and Welding

Electric Heating: Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

Electric Welding: Electric welding–Resistance and arc welding–Electric welding equipment– Comparison between AC and DC Welding

UNIT II

Illumination

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere,sources of light,Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT III

Electric Traction-I

System of electric traction and track electrification, Special features of traction motor, methods of electric braking-plugging rheostatic braking andregenerative braking. Mechanics of train movement, Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

UNIT IV

Electric Traction-II

Calculations of tractive effort, power, specific energy consumption for given run, effect of varyingacceleration and braking retardation, adhesive weight and braking retardation adhesive weight andcoefficient of adhesion, Principles of energy efficient motors.

TEXT BOOKS:

1.Utilisation of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.
3.Utilization of Electrical Power including Electric drives and Electric traction by J.B.Gupta, S.K. Kataria & Sons,10th edition, 2012
4.Sunil S Rao, "Utilization, generation & conservation of electrical energy", by Khanna publishers, first edition 2005.

E-RESOURCES:

1. http://nptel.iitm.ac.in/video.php?subjectId=108105060
2. http://www.nptel.ac.in/courses/108105061/Illumination%20%20Engineering/Lesson-20/pdf/L- 20(NKK)(IE)%20((EE)NPTEL).pdf
3. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/www.bee-india.org
4. www.irfca.org

HYBRID AND ELECTRICAL VEHICLES

(Open Elective-III)

Lecture – Tutorial:	3 - 0	**Internal Marks:**	40
Credits:		**External Marks:**	60

Course Objectives:

- To present a comprehensive overview of Electrical and Hybrid Electric Vehicles.
- Introduces Electrical and Hybrid Vehicles.
- Gains knowledge on hybrid electric drive trains, Electric Propulsion.
- Proper Energy Storage and Proper Sizing of the vehicle can be learnt.
- Design of a hybrid electric vehicle, Energy storage requirements and energy management strategies.

Course Outcomes:

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

CO1	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources
CO2	Design and develop basic schemes of electric vehicles.
CO3	Design and develop basic schemes of hybrid electric vehicles.
CO4	Choose proper energy storage systems for vehicle applications
CO5	Choose Proper Sizing of the Vehicle.
CO6	Identify various technologies used in vehicle networks.

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	2									
CO2	3	3	2									
CO3	2	1										
CO4	3											
CO5	2	3	2									
CO6	2	3	2									

UNIT I
Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance
UNIT II
Hybrid Electric Drive-trains: Basic concept of hybrid traction, introductionto various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives
UNIT III
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices, Matching the electric machine and the internal combustion engine (ICE)
UNIT IV
Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies
TEXT BOOKS:
1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
REFERENCE BOOKS:
1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003. 2. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
E-RESOURCES:
1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

MATLAB AND APPLICATIONS

(Open Elective-III)

Lecture – Tutorial:	3 - 0	Internal Marks:	40
Credits:		External Marks:	60

Course Objectives:
• In this course students will be introduced to programming using MATLAB. This course covers the MATLAB environment, assignment, conditionals, scripts, functions, iterations, arrays and graphics.

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Have knowledge of writing MATLAB programs for engineering problems.
CO2	Handle graphics and draw plots.
CO3	Work with arrays, matrices and character strings.
CO4	Using Built-in functions and plot graphs.
CO5	Interpolate the data and curve fitting.
CO6	Solving Problems in linear algebra.

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											
CO2	3											
CO3	3											
CO4	3											
CO5	3		2									
CO6	3	3	2									

UNIT I
Basics of MATLAB – windows, input, output file types, platform dependence commands, general commands, special variables and constants, simple arithmetic calculation, arrays, numbers, printing simple plots, creating, saving and executing script files, function files.
UNIT II
Matrices, vectors, matrix and array operations, arithmetic operations, relational operations, logical operations, matrix functions, specialized matrices, character strings, character string functions.
UNIT III
Built in function – saving and loading data, plotting simple graphs, script files, function files, language specific features, if-end structure, if-else-end structure, if-else if-else-end structure, switch-case statement, for-end loop, while-end loop, break, continue, and return commands, advanced data objects.
UNIT IV
Solving problems in linear algebra, curve fitting and interpolation, data analysis and statistics, integration, ordinary differential equations
TEXT BOOKS:
1. Getting started with MATLAB by Rudrapratap, oxford university press, 2009. 2. MATLAB programming for engineers by Stephen J.Chapman, Thomson Learnning.
REFERENCE BOOKS:
1. MATALB: An introduction with applications by Amos Gilad, Wiley student edition. 2. MATLAB programming by Y.Kirani Singh, B.B.Chaudhuri, PHI Private limited, New Delhi 2008
E-RESOURCES:
1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

ELECTRICAL SIMULATION LAB

Lecture – Tutorial:	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			
Power Electronics, Power Systems			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Simulate integrator circuit, differentiator circuit,
CO2	Simulate transmission line by incorporating line, load and transformer models.
CO3	Perform transient analysis of RLC circuit .
CO4	Perform transient analysis single machine connected to infinite bus(SMIB).
CO5	Simulate Boost converter, Buck converter.
CO6	Simulate full convertor and PWM inverter

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	2	3	3	0	0	0	0	0	0	0	2	0
CO4	2	0	1	0	1	0	0	1	0	0	2	0
CO5	3	0	0	0	0	0	0	1	0	0	0	1
CO6	2	0	1	0	0	0	0	1	0	0	0	0

Following experiments are to be conducted:

1. Simulation of transient response of RLC circuits
a. Response to pulse input
b. Response to step input
c. Response to sinusoidal input
2. Analysis of three phase circuit representing the generator transmission line and load. Plot
three phase currents & neutral current .
3. Simulation of single–phase full converter using RLE loads and single phase AC voltage
controller using RL loads
4. Plotting of Bode plots, root locus and nyquist plots for the transfer functions of systems
up to 5th order
5. Simulation of Boost and Buck converters.
6. Integrator & Differentiator circuits using op–amp.
7. Simulation of D.C separately excited motor using transfer function approach.

Any 2 of the following experiments are to be conducted:

1. Modeling of transformer and simulation of lossy transmission line.
2. Simulation of single phase inverter with PWM control.
3. Simulation of three phase full converter using MOSFET and IGBTs.
4. Transient analysis of single machine connected to infinite bus(SMIB).

MPMC LAB

Lecture – Tutorial:	3 Hours	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60
Prerequisites:			
Micro Processors and Microcontrollers			

Course Outcomes:	
Upon successful completion of the course, the student will be able to:	
CO1	Write Assembly Language Program Using 8086 Micro Based On Arithmetic Operations
CO2	Write Assembly Language Program Using 8086 Micro Based On Logical Operations
CO3	Write Assembly Language Program Using 8086 Micro Based On Shift Operations
CO4	Interface 8086 With I/O And Other Devices
CO5	Do Parallel Communication Using 8051 Micro Controllers
CO6	Do Serial Communication Using 8051 Micro Controllers

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	1	2	0	0	0	0	0	0	0	0	0
CO2	3	3	2	0	0	0	0	0	0	0	0	0
CO3	2	3	3	0	0	0	0	0	0	0	0	0
CO4	2	0	1	0	1	0	0	1	0	0	0	0
CO5	3	0	0	0	0	0	0	1	0	0	0	1
CO6	2	0	1	0	0	0	0	1	0	0	0	0

Any 10 of the following experiments are to be conducted:
Microprocessor 8086&Microcontroller 8051

PART- A: 8086 Assembly Language Programming

1.Introduction to MASM/TASM.

1. Arithmetic operation – Multi byte addition and subtraction, multiplication and division – Signed and unsigned arithmetic operation, ASCII – Arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3. By using string operation and Instruction prefix: Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison.
4. Interfacing 8255–PPI
5. Interfacing 8279 – Keyboard Display.

PART- B: 8051 Assembly Language Programs

6. Finding number of 1's and number of 0's in a given 8-bit number
7. Addition of even numbers from a given array
8. Average of n-numbers
9. Reading and Writing on a parallel port using 8051
10. Timer in different modes using 8051
11. Serial communication implementation using 8051
12. Understanding three memory areas of 00 – FF Using 8051 external interrupts.

PART-C: 8051 Interfacing

13. Switches and LEDs
14. 7-Segment display (multiplexed)
15. Stepper Motor Interface
16. Traffic Light Controller

Equipment Required:

1. MASM/TASM software
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segemt Units
10. Digital Multimeters

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DEPARTMENT OF MECHANICAL ENGINEERING

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I 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	20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	20A1100201	Engineering Mathematics-I	3	1	0	4	30	70	100	4
3	20A1100202	Engineering Physics	3	0	0	3	30	70	100	3
4	20A1101401	Engineering Drawing	1	0	4	5	30	70	100	3
5	20A1105301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
6	20A1100291	Engineering Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving with C Lab	0	0	3	3	15	35	50	1.5
Total			**13**	**1**	**10**	**24**	**180**	**420**	**600**	**19**

I 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	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200204	Engineering Chemistry	3	0	0	3	30	70	100	3
3	20A1201401	Engineering Mechanics	3	0	0	3	30	70	100	3
4	20A1202301	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100	3
5	20A1203401	Computer Aided Engineering Drawing	3	0	0	3	30	70	100	3
6	20A1203391	Workshop Practice Lab	0	0	3	3	15	35	50	1.5
7	20A1200293	Engineering Chemistry Lab	0	0	3	3	15	35	50	1.5
8	20A1201391	Basic Electrical & Electronics Engineering Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
10	20A1200801	Environmental Sciences	2	0	0	2	30	70*	100	0
Total			**17**	**0**	**12**	**29**	**240**	**560**	**800**	**21**

*** Internal Evaluation**

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

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DEPARTMENT OF MECHANICAL ENGINEERING

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I 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	20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	4
3	20A1100202	Engineering Physics	3	0	0	3	30	70	100	3
4	20A1101401	Engineering Drawing	1	0	4	5	30	70	100	3
5	20A1105301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
6	20A1100291	Engineering Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving with C Lab	0	0	3	3	15	35	50	1.5
Total			**13**	**1**	**10**	**24**	**180**	**420**	**600**	**19**

I 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	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200204	Engineering Chemistry	3	0	0	3	30	70	100	3
3	20A1201401	Engineering Mechanics	3	0	0	3	30	70	100	3
4	20A1202301	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100	3
5	20A1203401	Computer Aided Engineering Drawing	3	0	0	3	30	70	100	3
6	20A1203391	Workshop Practice Lab	0	0	3	3	15	35	50	1.5
7	20A1200293	Engineering Chemistry Lab	0	0	3	3	15	35	50	1.5
8	20A1201391	Basic Electrical & Electronics Engineering Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
10	20A1200801	Environmental Sciences	2	0	0	2	30	70*	100	0
Total			**17**	**0**	**12**	**29**	**240**	**560**	**800**	**21**

*** Internal Evaluation**

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

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20A1100101: PROFESSIONAL COMMUNICATION
(Common to CE, EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: None

Course Objectives

1. To strengthen the lexical ability of the students in different contexts.
2. To expose the students to various sub-skills and strategies of reading and writing – summarizing and paraphrasing.
3. To help the students develop effective writing skills through paragraph writing.
4. To train the students in fundamentals of grammar required to equip them with fluent English.
5. To enable the students to think critically by exposing them to different socio-cultural contexts through various literary texts.

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

CO1	Build the grammatical structures accurately in their real-time situations in either spoken or written form.
CO2	Extend their ability to use vocabulary from various texts along with GRE and technical vocabulary in written and spoken communication
CO3	Comprehend, analyze and evaluate texts critically. Demonstrate effective writing skills in specific forms of written communication (paragraphs, summaries, email and letters.)
CO4	Apply the strategies of reading various texts and graphs, and describe in prose.
CO5	Relate human values and professional ethics in their academic, professional and social lives.
CO6	Summarize the main events of the literary texts, from different socio-cultural contexts, and interpret them critically.

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										2		2
CO4										1		2
CO5								1				2
CO6												2

UNIT–I

1. **Text: A Drawer full of happiness** from **"Infotech English"**, Maruthi Publications
2. **Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information.
3. **Reading for Writing:** Paragraph Writing (specific topics) using suitable Cohesive Devices; Linkers, Sign Posts and Transition Signals; Mechanics of Writing - Punctuation, Capital Letters.
4. **Vocabulary:** Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal Reasoning and Sequencing of Words.
5. **Grammar:** Content Words and Function Words; Word Forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: Countables and Uncountables; Singular and Plural, Basic Sentence Structures; Simple Question Form - WH- Questions; Word Order in Sentences. Collocations (30 Phrases)

UNIT–II

1. **Text: Nehru's letter to his daughter Indira on her birthday** from **"Infotech English"**, Maruthi Publications
2. **Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

3. **Reading for Writing**: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
5. **Grammar**: Use of Articles and Zero Article; Prepositions; Connectives (25 words)

UNIT–III

Text: Stephen Hawking-Positivity 'Benchmark' from **"Infotech English"**, Maruthi Publications

1. **Reading**: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical Reading.
2. **Reading for Writing**: Summarizing - Identifying main ideas and Rephrasing what is read; avoiding Redundancies and Repetitions. Letter Writing-types, Format and Principles of Letter Writing. E-mail Etiquette, Writing CVs.
3. **Vocabulary**: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, Sequencing of Words
4. **Grammar**: Verbs, Phrasal Verbs - Tenses; Subject-Verb Agreement;

UNIT–IV

1. **Text: Liking a Tree, Unbowed: Wangari Maathai-biography** from **"Infotech English"**, Maruthi Publications
2. **Reading**: Studying the use of graphic elements in texts to convey information, reveal trends / patterns / relationships, communicative process or display complicated data.
3. **Reading for Writing**: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
5. **Grammar**: Quantifying Expressions - Adjectives and Adverbs; Comparing and Contrasting; Use of Antonyms; Direct and Indirect Speech, Reporting Verbs for Academic Purposes. Idiomatic Expressions (25 Idioms)

UNIT–V

1. **TEXT: Stay Hungry-Stay foolish** from **"InfoTech English"**, Maruthi Publications
2. **Reading**: Reading for Comprehension. RAP Strategy Intensive Reading and Extensive Reading Techniques.
3. **Reading for Writing**: Report writing (Significance, Format and Style of Writing Technical Reports)
4. **Vocabulary**: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, Matching Emotions.
5. **Grammar**: Change of Voice; Editing Short Texts – Identifying and Correcting Common Errors in grammar and usage (Articles, Prepositions, Tenses, Subject-Verb Agreement)

Text Book: "InfoTech English", Maruthi Publications.

REFERENCE BOOKS:

1. English Grammar in Use, Raymond Murphy, Cambridge University Press.
2. Oxford Practice Grammar, John Eastwood, Oxford University Press.
3. The Most Common Mistakes in English Usage – Thomas Elliott Berry
4. Essential Communication Skills – Shalini Agarwal, Ane Books Pvt Ltd.
5. Dictionary of Synonyms and Antonyms, Oxford & IBH, III Ed
6. A Practical English Grammar, Agnes V. Martinet and Audrey Jean Thomson, Oxford University Press.
7. English Vocabulary in Use, Michael McCarthy and Felicity O'Dell, Cambridge University Press

E-RESOURCES

1. https://www.grammarbank.com/
2. http://guidetogrammar.org/grammar/index.htm
3. https://writeandimprove.com/
4. https://englishforeveryone.org/
5. http://www.englishvocabularyexercises.com/
6. https://englishplusmagazine.com/

20A1100201 ENGINEERING MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture – Tutorial:	3-1 Hours	**Internal Marks:**	30
Credits:	4	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

1. To instruct the concept of Matrices in solving linear algebraic equations
2. To elucidate the different numerical methods to solve nonlinear algebraic equations
3. To disseminate the use of different numerical techniques for carrying out numerical integration.
4. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6) solve system of linear algebraic equations using Gauss elimination, Gauss Seidel and write Eigen values and eigenvectors of a matrix (L3)
CO2	Write diagonal form and different factorizations of a matrix (L3), to find inverse of a matrix and integral powers of a matrix by Cayley - Hamilton Theorem Identify the nature of a Quadratic form such as positive definite, positive semi definite etc., and use this information to facilitate the calculation of matrix characteristics (L2)
CO3	Evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
CO4	Apply Newton's forward & backward interpolation and Lagrange's formulae for unequal intervals (L3)
CO5	Apply numerical integral techniques to different Engineering problems (L3)
CO6	Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (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

Solving systems of linear equations, Eigen values and Eigen vectors: **(10hrs)**

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non- homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors and properties.

UNIT–II

Cayley–Hamilton theorem and Quadratic forms: **(10hrs)**

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT–III

Iterative methods: **(8 hrs)**

Introduction– Bisection method – Method of false position– Iteration method Newton-Raphson method (One variable). Gauss-Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT–IV

Interpolation: **(10 hrs)**

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula.

UNIT–V

Numerical integration and Solution of ordinary differential equations with initial conditions **(10 hrs)**

Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method – Runge-Kutta method (second and fourth order).

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.

REFERENCE BOOKS:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press.

E-RESOURCES:

1. www.nptelvideos.com/mathematics/(Math Lectures from MIT, Stanford, IIT'S
2. nptl.ac.in/courses/1221104017

20A1100202: ENGINEERING PHYSICS
(Common to CE and ME)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Knowledge on fundamental concepts of waves, optics, sound and magnetism

Course Objectives:

1. The course aims at making students to understand the basic concepts of Principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
2. To develop analytical capability and solve various engineering problems.

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

CO1	Apply the interaction of light with matter through interference, diffraction, polarization and identify these phenomena in different natural optical processes and optical instruments.
CO2	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications.
CO3	Interpret the knowledge of dielectric and magnetic materials with characteristic utility in appliances.
CO4	Apply the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment.
CO5	Apply the knowledge of non-destructive testing using ultrasonics in various engineering applications.
CO6	Study the Structure-property relationship exhibited by solid crystal materials for their utility.

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		
CO2	3	3		2	2					3		
CO3	3	3	3		3							
CO4	3				2							
CO5	3											
CO6	3				2							

UNIT–I (12hrs)

Wave Optics

Interference: Principle of superposition–Interference of light - Interference in thin films (Reflection Geometry) - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction-Types of polarization - Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT–II (8hrs)

Lasers and Fiber optics

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping Schemes – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

UNIT–III (10hrs)

Magnetic and Dielectric Materials

Magnetic Materials: Introduction - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation.

UNIT–IV **(10hrs)**

Acoustics and Ultrasonic's

Acoustics: Introduction – requirements of acoustically good auditorium– Reverberation – Reverberation time– Sabine's formula - Absorption coefficient and its determination – Factors affecting acoustics of buildings and their remedial measures.

Ultrasonic's: Introduction - Properties - Production by magnetostriction and piezoelectric methods – Detection - Non Destructive Testing – pulse echo system through transmission and reflection modes - Applications.

UNIT–V **(8hrs)**

Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattice – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X- ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics by P.K.Palanisamy SciTech publications.

REFERENCE BOOKS:

1. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
2. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
3. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

E-RESOURCES:

1. www.doitpoms.ac.uk
2. http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html
3. http://www.coherent.com/products/?834/Lasers

20A1101401: ENGINEERING DRAWING

(Common to Civil and Mechanical Engineering)

Lecture – Tutorial:	1 – 4 Hours	Internal Marks:	30
Credits:	3	External Marks:	70

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills

Course Objectives:

1. To introduce the students the usage of drawing instruments and to draw polygons, Engg. Curves and scales.
2. To introduce the students to use orthographic projections, projection of points & simple lines.
3. To make the students draw the projections of the lines inclined to both the planes.
4. To make the students draw the projections of the plane inclined to both the planes.
5. To make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
6. To represent the object in 3D view through isometric views and to convert the isometric view to orthographic view and vice versa.

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

CO1	Understand the simple geometric constructions like polygons, engineering curves and scales.
CO2	Understand the orthographic projections of points and lines
CO3	Understand the orthographic projections of straight lines- inclined to one plane and inclined to both the planes.
CO4	Understand the orthographic projections of planes and Planes inclined to both the planes.
CO5	Understand and draw the projections of the various types of solids in different positions inclined to one of the planes
CO6	Understand the transformation of orthographic views into isometric views and vice versa.

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		1
CO2	3	2								3		1
CO3	3	2								3		1
CO4	3	2			2					3		1
CO5	3	2			2					3		1
CO6	3	2			2					3		1

UNIT–I **(14hrs)**

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.
Scales: Plain scales, diagonal scales and vernier scales

UNIT–II **(12hrs)**

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both planes, determination of true lengths, angle of inclination.

UNIT–III **(10hrs)**

Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT–IV (10hrs)
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.
UNIT–V (14hrs)
Isometric Projections: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views. Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD. **Note:** In the End Examination there will be no question from CAD.
TEXT BOOKS: 1. Engineering Drawing by N.D. Bhatt, Chariot Publications 2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
REFERENCE BOOKS: 1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers 2. Engineering Graphics for Degree by K.C. John, PHI Publishers 3. Engineering Graphics by PI Varghese, McGrawHill Publishers 4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
E-RESOURCES: 1. http://nptel.iitm.ac.in/

20A1105301: PROGRAMMING AND PROBLEM SOLVING WITH C
(Common to EEE, ME, ECE, CSE, IT, AIML and DS)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Basic knowledge on computers, Mathematics

Course Objectives: The objectives of Programming for Problem Solving Using C are

1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2. To gain knowledge of the operators, selection, control statements and repetition in C
3. To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
4. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5. To assimilate about File I/O and significance of functions

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

CO1	Understand the programming terminology and implement various c-tokens & input-output statements to solve simple problems
CO2	Able to compare and differentiate various looping & branching constructs and apply the best looping structure for a given problem
CO3	Identify the necessity of modularity in programming and design various function types
CO4	Understand pointers and implement the programs to directly access memory locations
CO5	Interpret and implement the need of arrays and structure/union to store homogeneous and heterogeneous groups of data
CO6	Contrast the need of using files in programming and implement file operations

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		1	3									
CO3		1	3									
CO4	3		1									
CO5			3									
CO6			3									

UNIT–I

Basics And Introduction to C: Basics of Computer, Introduction to C, Machine, Assembly and High level Language, Assembler, Compiler and Interpreter, Structure of a C program, Programming Rules, Executing the C Program, Advantages of C, Header Files, Flow Chart, Algorithm.

The C Declarations: The C-Character set, Delimiters, Types of Tokens, The C keywords, Identifiers, Constants, Variables, C Data types, initialization, type modifiers, type conversions, constant and volatile variables. Properties of Operators, Operator Priority ,comma and conditional operators, arithmetic, relational, assignment operators and expressions, logical , bitwise operators. Input and output in c: Formatted and Unformatted functions

UNIT–II

Decision Statements: if statement, if-else, nested if else, if-else-if ladder, break, continue, goto, Switch statement, nested switch case, Switch case and nested ifs.

Loop Control: for loop, nested for loop, while, do-while, do-while statement with while loop.

Arrays: Array initialization, array terminology, characteristics of an array, 1-D array and its operations, 2-D arrays and operations, Multi -dimensional arrays.

Strings: Declaration and initialization of string, string standard functions, string conversion functions, memory functions, application of strings.

UNIT–III

Functions: Basics, function definition, return statement, types of functions, call by value ,call by reference, function as an argument. Functions with operators. Function and Decision Statements.

20A1100291: ENGINEERING PHYSICS LAB
(Common to CE and ME)

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

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

1. The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies.
2. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
3. Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.

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

CO1	Understand principle, concept, working of an instrument and can compare results with theoretical calculations.
CO2	Analyze the physical principle involved in the various instruments; also relate the principle to new application.
CO3	Understand design of an instrument with targeted accuracy for physical measurements.
CO4	Develop skills to impart practical knowledge in real time solution.
CO5	The various experiments in the areas of optics, mechanics and thermal physics will nurture the students in all branches of Engineering..
CO6	Think innovatively and also improve the creative skills that are essential for engineering.

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	3		3					3			
CO3	3	3	1	3					3			
CO4	3	3		3								
CO5	3											
CO6	3	3	2	3								

LIST OF EXPERIMENTS

1. Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.
2. Determination of numerical aperture and acceptance angle of an optical fiber.
3. Determination of thickness of thin object by wedge method.
4. Determination of radius of curvature of given plano convex lens by Newton's rings.
5. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
6. Determination of dispersive power of the prism.
7. Sonometer: Verification of laws of string.
8. Study of I/V Characteristics of Semiconductor diode.
9. I/V characteristics of Zener diode.
10. Melde's experiment-Longitudinal and Transverse mode.
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
14. Determination of wavelength of Laser light using diffraction grating.
15. Rigidity modulus of material of a wire-dynamic method (Torsional pendulum).

Note: Any 8 experiments out of 15 should be done in the laboratory and 2 experiments in virtual lab.

TEXT BOOKS:

S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

REFERENCE BOOKS:

Functions and loop Statements, Functions with arrays and Pointers, Recursion-Types of Recursion, Rules for Recursive Function, Recursion versus Iterations, Advantages and Disadvantages of Recursion, Efficiency of Recursion, Library Functions.

Storage Class: Variable Lifetime, Automatic Variables, External Variables, Static Variables, Register Variables.

UNIT–IV

Pointers: Features of pointers, pointers and address, pointer declaration, void pointers, arithmetic operations with pointers, pointers and arrays, array of pointers, pointers to pointers, pointers and strings. Dynamic memory allocation

Preprocessor Directives: The #define Directive, Defining and Undefining a Macros, The #include Directive

UNIT–V

Structure And Union: Features of Structures, Declaration and initialization of Structures, Structure within Structure, Arrays of Structure, Pointer to Structure, Structure and functions, typedef, Bit fields, Enumerated Data Type, Unions and Unions Vs Structures.

Files: Streams and File Types, Steps for File Operations, FILE I/O, Structures Read and Write, Other file function, Command line Arguments.

TEXT BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg , —"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

2. Kernighan and Ritchie, —"The C programming language" , The (Ansi C Version), PHI, second edition.
3. Yashwant Kanetkar, —"Let us C" , BPB Publications, 2nd Edition 2001.
4. Paul J. Dietel and Dr. Harvey M. Deitel, —"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
5. Herbert Schildt, —"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
6. K.R.Venugopal, Sundeep R Prasad, —"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1. http://cslibrary.stanford.edu/101/EssentialC.pdf
2. http://nptel.ac.in/courses/106104128/
3. http://www.vssut.ac.in/lecture_notes

Engineering Physics / Applied Physics Lab Manual – Spectrum Publications
E-RESOURCES: 1. www.vlab.co.in

20A1105391: PROGRAMMING AND PROBLEM SOLVING WITH C LAB
(Common to EEE, ME, ECE,CSE, IT, AIML and DS)

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

Course Objectives:

1. To make the student learn a programming language.
2. To learn problem solving techniques.
3. To teach the student to write programs in C and to solve the problems

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

CO1	Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables.
CO2	Exercise conditional and iterative statements to inscribe C programs.
CO3	Exercise user defined functions to solve real time problems.
CO4	Inscribe C programs using Pointers to access arrays, strings and functions.
CO5	Inscribe C programs using pointers and allocate memory using dynamic memory management functions.
CO6	Exercise user defined data types including structures, unions and files to solve 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	1		3									
CO2			2									
CO3			3									
CO4			2									
CO5			3									
CO6		2	3									

LIST OF EXERCISES

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.

TEXT BOOKS:

1. Behrouz A. Forouzan & Richard F. Gilberg , —"Computer Science A Structured Programming Approach using C" , CENGAGE Learning, Third Edition.

REFERENCE BOOKS:

2. Kernighan and Ritchie , —"The C programming language" , The (Ansi C Version), PHI, second edition.
3. Yashwant Kanetkar , —"Let us C" , BPB Publications, 2nd Edition 2001.
4. Paul J. Dietel and Dr. Harvey M. Deitel, —"C: How to Program", Prentice Hall, 7 th edition (March 4,2012).
5. Herbert Schildt, —"C:The Complete reference", McGraw Hill, 4th Edition, 2002.
6. K.R.Venugopal, Sundeep R Prasad, —"Mastering C", McGraw Hill, 2nd Edition, 2015

E-RESOURCES:

1. http://cslibrary.stanford.edu/101/EssentialC.pdf
2. http://nptel.ac.in/courses/106104128/
3. http://www.vssut.ac.in/lecture_notes

20A120001: ENGINEERING MATHEMATICS-II
(Common to All Branches)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Fundamentals of matrices, Fundamentals of Trigonometry and Calculus.

Course Objectives:

1. To familiarize a variety of well-known sequences and series, with a developing intuition about the behavior of new ones.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

CO1	Find the General/Particular solutions of first order and first degree ordinary differential equations by apply different methods (L3), know the applications of Newton's law of cooling, natural growth and decay problems and find orthogonal trajectories of the given family of curves. (L3)
CO2	Identify the essential characteristics of linear differential equations with constant coefficients. (L2)solve the linear differential equations with constant coefficients by appropriate method (L3)
CO3	Find convergence (or) divergence of a series (L3)
CO4	Utilize mean value theorems to real life problems(L3)
CO5	Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L4)acquire the Knowledge maxima and minima of functions of several variable (L1) Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)
CO6	Find length of the arc, volume of solid of revolution and surface area of solid of revolution(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

Differential equations of first order and first degree: **(10hrs)**

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling– Law of natural growth and decay– Orthogonal trajectories.

UNIT–II

Linear Differential equations of higher order: **(10hrs)**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.

UNIT–III

Sequences, Series and Mean value theorems: **(10hrs)**

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series– Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorem.

UNIT–IV

Partial differentiation: **(10hrs)**

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's multiplied method.

UNIT–V

Multiple integrals: **(8hrs)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volumes

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana,Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw HillEducation.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14thEdition, Pearson.
3. Lawrence Turyn, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.

E-RESOURCES:

1. www.nptel videos.com/mathematics/(Math Lectures from MIT,Stanford,IIT'S
2. nptl.ac.in/courses/1221104017

20A1200204 : ENGINEERING CHEMISTRY
(Common to CE and ME)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites: Fundamentals of Polymers and Electro Chemical cells.

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

1. Engineering Chemistry is an applied manifestation of Chemistry and its thorough knowledge in fundamental aspects, essential for Civil and Mechanical to understand chemical structure and other aspects of materials.
2. The study of applied concepts of Chemistry endeavored in this course namely; Polymer technology, electrochemistry, corrosion, Chemistry of materials, fuels and water treatment helps the student in comprehending their engineering applications with right aptitude and ability in predicting the results under given conditions.

Course Outcomes:

CO1	Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
CO2	Predict potential complications from combining various chemicals and metals in engineering setting
CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
CO4	Apply Nano chemistry, Refractories, Lubricants, cement in engineering processes
CO5	Discuss the various petroleum products and alternate fuels
CO6	Examine the water quality and select appropriate purification technique for intended problem

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								
CO2	3	3	2	1								
CO3	3	2	2	1								
CO4	3	3	2	2								
CO5	3	2	2	1								
CO6	3	3	2	1								

UNIT–I

Polymer Technology **(10 hrs)**

Polymerisation: Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Thermoplastic-thermosetting Compounding, fabrication (compression, injection, transfer and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets.

Elastomers: Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes). **Composite materials:** Fiber reinforced plastics, conducting polymers, biodegradable polymers,

UNIT–II

Electrochemical Cells And Corrosion **(10 hrs)**

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, batteries (Dry cell, liquid Li ion battery), fuel cells (H2-O2).

Corrosion:-Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, galvanic series, factors influencing rate of corrosion, corrosion control methods-Protective coatings (Galvanizing, tinning electroplating and electroless plating [nickel]),

UNIT–III

Chemistry Of Materials **(10 hrs)**

Nano materials:- Introduction, sol-gel method, characterization by transmission electron microscopy [TEM]) , carbon nanotubes (types, preparation and applications)

Refractories: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.

Lubricants: - Definition, mechanism of lubricants, properties (definition and importance).

Cement: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

UNIT–IV

Fuels **(10 hrs)**

Introduction, calorific value, higher calorific value, lower calorific values, problems using Dulong's formula, proximate and ultimate analysis of coal sample and their significance, petroleum (refining-cracking), synthetic petrol (Fischer Tropsch), petrol knocking, diesel knocking, octane and cetane ratings, anti-knocking agents, Introduction to alternative fuels (Bio-diesel, natural gas, liquefied petroleum gas, compressed natural gas), Flue gas analysis by Orsat apparatus.

Unit–V

Water Technology **(8 hrs)**

Hardness of water, determination of hardness by complexometric method, boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement), internal treatments, softening of hard water (zeolite process and ion exchange process), potable water and its specifications, steps involved in purification of water, chlorination, break point chlorination-desalination (reverse osmosis and electro dialysis).

TEXT BOOKS:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand & Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).

REFERENCE BOOKS:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, "Textbook of Nanoscience and Nanotechnology", University press (latest edition)

E-RESOURCES:

1. https://en.wikipedia.org >wiki> Water treatment
2. https://en.wikipedia.org >wiki> Conductive polymers
3. www.sae.org/fuel cells/fuelcells-types.htm
4. https://en.wikipedia.org >wiki> Nanomaterials
5. https://en.wikipedia.org >wiki> Electrochemical cell
6. https:// www.britancia.com>technology>cement-building-material

20A1203301: ENGINEERING MECHANICS

(Mechanical Engineering)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:

1. Engineering Physics
2. Engineering Mathematics

Course Objectives:

1. To introduce the concepts of force and friction, direction and its application to the students.
2. To make the students expose to the application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
3. To introduce the concepts of centre of gravity, concepts of moment of inertia and polar moment of inertia including transfer methods and their applications to the students.
4. The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion
5. The students are to be exposed to rigid body motion kinematics and kinetics

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

CO1	Compute the resultant of forces and moments using free body diagrams and able to apply the concepts of friction.
CO2	Analyze plane truss (Frame) by method of joints and method of sections.
CO3	Identify the Centroid and Centre of Gravity of the simple and composite figures and bodies, also to determine the area and mass moment of inertia of the composite figures and bodies.
CO4	Understand the fundamental concepts of Rectilinear and curvilinear motion of a particle.
CO5	Understand the fundamental concepts of kinematics and kinetics of rigid body.
CO6	Able to apply the work energy and Impulse momentum principle to analyze the simple, practical 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	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										

UNIT–I

Introduction to Engg. Mechanics – Basic Concepts.

Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT–II

Equilibrium of Systems of Forces: Free Body Diagrams, , Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for beams, Analysis of plane trusses.

UNIT–III

Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

Area moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT–IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.

UNIT–V

Rigid body Motion: Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

TEXT BOOKS:

1. Engineering Mechanics - S.Timoshenko & D.H.Young., 4th Edition - , Mc Graw Hill publications.

REFERENCE BOOKS:

1. Engineering Mechanics by S S Bhavikatti, New age International
2. Engineering Mechanics by R K Bansal, Laxmi Publications

20A1202301: BASIC ELECTRICAL & ELECTRONICS ENGINEERING (MECHANICAL ENGINEERING)

Lecture:	3 Hours	**Internal Marks:**	30
Credits:	3	**External Marks:**	70

Prerequisites:
This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Course Objectives:

1. To learn the basic principles of electrical circuital law's and analysis of networks.
2. To understand principle of operation and construction details of DC machines.
3. To understand principle of operation and construction details of transformers, alternator and 3- Phase induction motor.
4. To study operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
5. To learn operation of PNP and NPN transistors and various amplifiers.

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

CO1	Analyze various electrical networks.
CO2	Understand operation of DC generators,3-point starter
CO3	Understand operation of DC machine testing by Swinburne's Test and Brake test.
CO4	Analyze performance of single-phase transformer and acquire proper knowledge and working of 3-phase alternator and 3-phase induction motors.
CO5	Analyze operation of half wave, full wave bridge rectifiers and OP-AMPs.
CO6	Understanding operations of CE amplifier and basic concept of feedback amplifier.

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								
CO2	3	3	2	1								
CO3	3	2	2	1								
CO4	3	3	2	2								
CO5	3	2	2	1								
CO6	3	3	2	1								

UNIT–I

Electrical Circuits
Basic definitions – types of network elements – Ohm's Law – Kirchhoff's Laws – inductive networks – capacitive networks – series – parallel circuits – star-delta and delta-star transformations.-Numerical Problems.

UNIT–II

DC Machines
Principle of operation of DC generator – EMF equation – types of DC machines – torque equation characteristics of DC motors – applications – three point starter – speed control methods of DC motor – Swinburne's Test-Brake test on DC shunt motor-Numerical problems.

UNIT–III

AC Machines:
Transformers
Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests – efficiency and regulation-Numerical Problems.
AC Rotating Machines
Principle of operation and construction of alternators – types of alternators Regulation of alternator by synchronous impedance method – principle of operation of synchronous motor – principle of operation of 3-Phase induction motor – slip-torque characteristics – efficiency – applications- Numerical Problems

UNIT–IV

Rectifiers & Linear ICs

PN junction diodes – diode applications (half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) – application of OP-AMPs (inverting, non-inverting, integrator and differentiator)-Numerical Problems.

UNIT–V

Transistors

PNP and NPN junction transistor, transistor as an amplifier– frequency response of CE amplifier – Basic concepts of feedback amplifier-Numerical problems.

TEXT BOOKS:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits by R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

REFERENCE BOOKS:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications,2nd edition
5. Industrial Electronics by G.K. Mittal, PHI

20A120340: COMPUTER AIDED ENGINEERING DRAWING

(Mechanical Engineering)

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

Prerequisites:

1. Knowledge of basic Mathematics
2. Drawing skills
3. Engineering Drawing

Course Objectives:

1. To draw the projections of solids and to enhance the skills they already acquired in their earlier course in drawing of projection.
2. To Design and Manufacture the objects from the knowledge of sections of solids and development of surfaces.
3. To learn the methods of Isometric and Perspective views.
4. To introduce various commands in AutoCAD, to draw the geometric entities and to create 2D and 3D wire frame models.
5. To understand the concept of View Points and View Ports.
6. 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	Understand the sections of solids and development of surfaces for designing and manufacturing of the objects.
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)

	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					3		1
CO5	3	2			3					3		1
CO6	3	2			3					3		1

UNIT–I

Projections Of Solids: Projections of Regular Solids inclined to both planes – Auxiliary Views.

UNIT–II

Sections Of Solids: Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

Development And Interpenetration Of Solids: Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid, Cone and their parts.

UNIT–III

Interpenetration Of Right Regular Solids: Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Prism Vs Cone.

Perspective Projections: Perspective View: Points, Lines, Plane Figures and Simple

Solids, Vanishing Point Methods (General Method only).

In part B computer aided drafting is introduced

UNIT–IV

Introduction To Computer Aided Drafting: Generation of points, lines, curves, polygons, dimensioning. Types of modeling: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

UNIT–V

View Points And View Ports: view point coordinates and view(s) displayed, examples to exercise different options like save restore, delete, joint, single option.

UNIT–VI

Computer Aided Solid Modeling: Isometric projections, orthographic projections of isometric projections, Modeling of simple solids, Modeling of Machines & Machine Parts.

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.

Note: End Semester examination shall be conducted for* Four *hours with the following pattern

a) Two hours-Conventional drawing
b) Two hours – Computer Aided Drawing

20A1200801: ENVIRONMENTAL SCIENCE
(Common to CE, EEE, ME and ECE)

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

Prerequisites:
1. Engineering chemistry.
2. Engineering physics.

Course Objectives:
1. Overall understanding of the natural resources.
2. Basic understanding of the ecosystem and its diversity.
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impact of developmental activities.
5. Awareness on the social issues, environmental legislation and global treaties.

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

CO1	Illustrate the importance of sustainability in the progress of a nation. (L2)
CO2	Infer the existence of ecosystems in maintaining ecological balance. (L2)
CO3	Recall the importance of biodiversity and its conservation. (L1)
CO4	Summarize the role of natural resources for the sustenance of life on earth and recognize the need to conserve them. (L2)
CO5	Identify the environmental pollutants and the abatement devices to be used. (L3)
CO6	Interpret environmental related acts and social issues. (L2)

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	3	2			2	2
CO2	3	2	2			2	3	2			2	2
CO3	3	2	2			2	3	2			2	2
CO4	3	2	2			2	3	2			2	2
CO5	3	2	2			2	3	2			2	2
CO6	3	2	2			2	3	2			2	2

UNIT–I

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Food chains, food webs and ecological pyramids-Ecological succession. **(6hrs)**

UNIT–II

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social value. India as a mega diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. Endangered and endemic species of India – Conservation of biodiversity. **(4hrs)**

UNIT–III

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate

energy sources. Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles. **(7hrs)**

UNIT–IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management. **(5hrs)**

UNIT–V

Social Issues and the Environment: Urban problems related to energy, rain water harvesting. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS. Ecotourism, Green Campus – Green business and Green politics. **(6hrs)**

TEXT BOOKS:

1. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014
2. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
4. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai.

REFERENCE BOOKS:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi.

E-RESOURCES:

1. http://nptel.ac.in/courses.php.
2. http://jntuk-coeerd.in/

20A1200191: COMMUNICATIVE ENGLISH LAB
(Common to All Branches (CE, EEE, MECH, ECE, CSE, IT, AIML, DS)

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

Prerequisites:
1. English grammar
2. Word pronunciations

Course Objectives:
1. To learn the sound systems of English and understand word stress of English.
2. To train the students in the art of conversation and discussion
3. To equip the students with good communication skills.
4. To emphasize the need of English in the technical world.
5. To improve their presentation and participation skills
6. To prepare them for interviews and future job environments.

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

CO1	Demonstrate better understanding of the nuances of spoken English to put into use in various situation and events.
CO2	Apply the rules of phonetics–pronunciation, accent and intonation– in their everyday communication
CO3	Relate their understanding of the importance of spoken skills and the need for life-long learning in day-to-day communication.
CO4	Construct strategies like critical and analytical skills to participate effectively in group discussions and debates.
CO5	Demonstrate their ideas accurately and effectively in presentations.
CO6	Build responses to the questions by listening to short audio texts and identify the context and specific pieces of information.

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												2
CO4									1	1		2
CO5										2		2
CO6										1		2

UNIT–I
1. Making Inquiries on the phone, Thanking and Responding to Thanks, Responding to Requests and Asking for Directions
2. Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation

UNIT–II
1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating, Apologising, Advising, Suggesting, Agreeing and Disagreeing
2. Word stress – Di-Syllabic Words, Poly-Syllabic Words, Weak and Strong Forms, Contrastive Stress (Homographs)

UNIT–III
1. Debating
2. Stress in Compound Words, Rhythm, Intonation, Accent Neutralization.

UNIT–IV
1. Group Discussions

2. Listening to Short Audio Texts, and Identifying the context and specific pieces of information to answer a series of questions in speaking.
UNIT–V 1. Presentation Skills and Interview Skills 2. Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.
Lab Manual: "Infotech English", Maruthi Publications.
Software: k-van solutions Multimedia language lab
REFERENCE BOOKS:
Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL. English Pronunciation in use - Mark Hancock, Cambridge University Press. English Phonetics and Phonology-Peter Roach, Cambridge University Press. English Pronunciation in use- Mark Hewings, Cambridge University Press. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications
E-RESOURCES
https://learnenglish.britishcouncil.org/ https://rachelsenglish.com/ https://www.bbc.co.uk/learningenglish/ https://www.engvid.com/ https://bbclearningenglish.com

20A1200203: ENGINEERING CHEMISTRY LAB
(Common to CE and ME)

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

Prerequisites: Knowledge on Volumetric analysis.

Course Objectives:

1. To provide knowledge of chemistry practical's.
2. It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
3. It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

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

CO1	Apply polymers and plastic technologies to solve the problems of the society.
CO2	Utilize knowledge of cells and sensors in many instruments like batteries and fuel cells.
CO3	Understand electrochemical cells corrosion along with the methods of controlling to budding engineers.
CO4	Understand water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	Understand fuels and energy, their advantages & disadvantages.
CO6	Design and analysis of complex problems of the society.

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								
CO2	3	3	1									
CO3	3	2	2									
CO4	3	1		1								
CO5	3	2	2	1								
CO6	3	1	1	1								

LIST OF EXPERIMENTS

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Determination of HCl using standard Na_2CO_3 solution.
3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
4. Determination of $KMnO_4$ using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard $K_2Cr_2O_7$ solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Preparation of Bakelite.
12. Determination of pH of water sample.

EQUIPMENT REQUIRED: PH meters, Potentiometers, Conductometers, colorimeters.

APPARATUS: Burettes, Pipettes, Conical flask, Beakers, Volumetric flask.

REFERENCE BOOKS:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) Laboratory Manual of engineering chemistry-II, VGSTechno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) Practical Engineering Chemistry, B.S. Publication.

20A1203391: WORKSHOP PRACTICE LAB

(Mechanical Engineering)

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

Prerequisites:

1. Knowledge of Engineering Drawing

Course Objectives:

To impart hands-on practice on basic engineering trades such as Carpentry, Fitting, Tin-Smithy, Black smithy, House wiring and Assembly & Disassembly of Computer.

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

CO1	Acquire skills in basic engineering trades like Carpentry, Fitting, Tin smithy, House wiring, Black smithy etc.,
CO2	Apply the knowledge of basic engineering trades in their day – to – day activities.
CO3	Fabricate small components using the knowledge of basic engineering trades.
CO4	Select appropriate tools and consumables for getting an object of required shape and size.
CO5	Configure the components and peripherals of PC.
CO6	Assemble and disassemble the PC components.

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			3					2		
CO5	3	2	2	2	3					2		
CO6	3	2	2	2	3					2		

LIST OF EXPERIMENTS

Trade wise:

1. **Carpentry**
   1) T-Lap Joint
   2) Cross Lap Joint
   3) Dovetail Joint
   4) Mortise and Tenon Joint
2. **Fitting**
   1) Vee Fit
   2) Square Fit
   3) Half Round Fit
   4) Dovetail Fit
3. **Black Smithy**
   1) Round rod to Square
   2) S-Hook
   3) Round Rod to Flat Ring

4) Round Rod to Square headed bolt

4. House Wiring

1) Parallel / Series Connection of three bulbs

2) Stair Case wiring

3) Florescent Lamp Fitting

4) Measurement of Earth Resistance

5. Tin Smithy

1) Taper Tray

2) Square Box without lid

3) Open Scoop

4) Funnel

6. IT Workshop

1) Assembly & Disassembly of Computer

Note: At least two Jobs to be done from each trade (Excluding IT Workshop).

REFERENCE BOOKS:

1. Elements of Workshop Technology vol.-1 & vol.-2 by A. K. Hajra Choudhury, S. K. Hajra Choudhury, Nirjhar Roy
2. Workshop Manual , P.Kannaih,K.L. Narayana , Scitech Publishers
3. Workshop Manual by Dept. of Mechanical Engg., NRIIT
4. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.

20A1201391: BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB
(Mechanical Engineering)

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

Prerequisites: Basics of various electrical circuits, operation of various electrical machines and electronic components to perform well in their respective fields.

Course Objectives:

1. To predetermine the efficiency of dc shunt machine using Swinburne's test.
2. To predetermine the efficiency and regulation of 1-phase transformer with O.C and S.C tests.
3. To obtain performance characteristics of DC shunt motor &3-phase induction motor.
4. To find out regulation of an alternator with synchronous impedance method.
5. To control speed of dc shunt motor using Armature voltage and Field flux control methods.
6. To find out the characteristics of PN junction diode & transistor, ripple factor of half wave & full wave rectifiers.

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

CO1	Compute the efficiency of DC shunt machine without actual loading of the machine.
CO2	Estimate the efficiency and regulation at different load conditions and power factors for single phase transformer with OC and SC tests.
CO3	Analyze the performance characteristics and to determine efficiency of DC shunt motor &3- Phase induction motor.
CO4	Pre-determine the regulation of an alternator by synchronous impedance method.
CO5	Control the speed of dc shunt motor using Armature voltage and Field flux control methods.
CO6	Draw the characteristics of PN junction diode & transistor, Determine the ripple factor of half wave & full wave rectifiers.

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			3					2		
CO5	3	2						3		2		
CO6	3	2		3						2		

LIST OF EXPERIMENTS

Section A: Electrical Engineering

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine (predetermination of efficiency of a given D.C. shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (predetermination of efficiency and regulation at given power factors).
3. Brake test on 3-phase Induction motor (determination of performance characteristics)
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
6. Brake test on D.C. Shunt Motor.

Section B: Electronics Engineering

The following experiments are required to be conducted as compulsory experiments:

1. PN junction diode characteristics a) Forward bias b) Reverse bias (Cut in voltage and resistance calculations)
2. Transistor CE characteristics (input and output)
3. Half wave rectifier with and without filters.
4. Full wave rectifier with and without filters.
5. CE amplifiers.
6. OP- amp applications (inverting, non inverting, integrator and differentiator)

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 ELECTRONICS AND COMMUNICATION ENGINEERING

2020 - 2021
NR/A 18

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III 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	18A3104401	Linear and digital Integrated circuits	3	1	-	4	40	60	100	4
2	18A3104402	Digital Communications	3	1	-	4	40	60	100	4
3	18A3104403	Antennas and Wave Propagation	3	1	-	4	40	60	100	4
4	18A3104511 18A3104512 18A3104513	**Professional Elective I** i) Telecommunication Switching systems and networks ii) Computer Organisation and Architecture iii) Electronic Measurements and Instrumentation	3	-	-	3	40	60	100	3
5	OE	**Open Elective III**	3	-	-	3	40	60	100	3
6	18A3104802	IPR and Patents	2	-	-	2	40	60	100	0
7	18A3104491	Linear and Digital Integrated Circuit laboratory	-	-	2	2	40	60	100	1
8	18A3104492	Digital Communication Laboratory	-	-	2	2	40	60	100	1
9	18A3104493	VHDL Programming Lab	-	-	2	2	40	60	100	1
Total			**17**	**3**	**6**	**26**	**360**	**540**	**900**	**21**

III 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	18A3204401	VLSI Design	3	1	-	4	40	60	100	4
2	18A3204402	Digital Signal Processing	3	1	-	4	40	60	100	4
3	18A3204403	Microprocessors and Microcontrollers	3	1	-	4	40	60	100	4
4	18A3204511 18A3204512 18A3204513	**Professional Elective II** Cellular & Mobile Communications Digital System Design Electromagnetic Interference & Electromagnetic Compatibility	3	-	-	3	40	60	100	3
5	OE	**Open Elective IV**	3	-	-	3	40	60	100	3
6	18A3204491	Microprocessors and Microcontrollers Laboratory	-	-	2	2	40	60	100	1
7	18A3204492	Digital Signal Processing Laboratory	-	-	2	2	40	60	100	1
8	18A3204493	VLSI Laboratory	-	-	2	2	40	60	100	1
Total			**15**	**3**	**6**	**24**	**320**	**480**	**800**	**21**

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NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl), Krishna Dist.

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0 0 2 1

VHDL PROGRAMMING LAB

Practice:	2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites:

Switching Theory and Logic Design, C Language, Pulse & Digital Circuits Laboratory

Course Objectives:

- Introduce the basic HDL languages and their importance in digital design.
- VHDL fundamentals were discussed to modelling the digital system design blocks.
- Model digital systems at several levels of abstractions, dataflow, behavioural, structural & mixed signalling modelling.
- Analyse and design basic digital circuits with combinatorial and sequential logic circuits using VHDL.
- VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.

Course Outcomes:

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

CO1	Understand the three different modeling styles of digital circuits.
CO2	Design various combinational circuits using VHDL.
CO3	Develop a VHDL source code for comparators and code converters.
CO4	Perform simulation of various sequential circuits using VHDL.
CO5	Analyze the obtained simulation results.
CO6	Verify the logic with the necessary hardware.

List of Experiments: (Minimum of ten experiments has to be performed)
Note: The students are required to develop VHDL source code, perform simulation using a relevant simulator, and analyze the obtained simulation results using a necessary synthesizer. All the experiments are required to verify and implement the logical operations on the latest FPGA Hardware in the Laboratory.

1. Realization of logic gates using three models.
2. Design of full adder and develop VHDL code using three models.
3. Design 3 to 8 decoders and develop VHDL code.
4. Design 8 to 3 encoder and develop VHDL code.
5. Design 8 x 1 multiplexer and develop VHDL code.
6. Design 4- bit magnitude comparator and develop VHDL code.
7. Design 4-bit binary to grey code converter and develop VHDL code.
8. Design D-flip-flop and develop VHDL code.

List of Experiments:

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Phase shift keying.
7. Differential phase shift keying.
8. Companding
9. Source Encoder and Decoder
10. Linear Block Code-Encoder and Decoder
11. Binary Cyclic Code – Encoder and Decoder
12. Convolution Code – Encoder and Decoder

Equipment Required:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz. /0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components

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	2	3	-	-	2	-	-	-	1	-	-	-	-	-
CO2	-	3	2	-	-	-	-	2	-	-	-	-	-	3
CO3	2	-	-	3	-	-	-	-	-	3	-	-	-	3
CO4	2	2	2	-	-	-	3	-	2	-	-	-	-	-
CO5	-	-	-	-	-	3	-	-	-	-	2	-	-	3
CO6	3	-	2	-	3	-	-	-	-	-	-	3	-	-

III Year - I Semester **L T P C**

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III Year - I Semester

L T P C
0 0 2 1

DIGITAL COMMUNICATIONS LAB

Practice:	2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites:

Basics of Communications, Signals & Systems and Probability & Random Processes.

Course Objectives:

- To acquire practical knowledge of digital communication systems.
- To implement different modulation and demodulation techniques.
- To analyze the outputs of various digital modulation techniques.
- To perform and interpret various source coding and error control coding techniques.

Course Outcomes:

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

CO1	Understand the Time-Division Multiplexing systems, and verify the output of pulse code modulation and demodulation.
CO2	Analyze the output of differential pulse code modulation and demodulation and verify the delta modulation.
CO3	Analyze the outputs of different digital modulation techniques-FSK, PSK.
CO4	Interpret the outputs of DPSK modulation and demodulation.
CO5	Analyze the outputs of source encoder and decoder, linear block codes, convolution codes and binary cyclic codes.
CO6	Perform and analyze the output of companding circuit.

6. Bread Boards.
7. Components:- IC741, IC555, IC74151, IC74155, IC74LS90, IC Tester.

Experiments to be conducted beyond the syllabus:

1. IC 741 Oscillator Circuit - Wien Bridge Oscillator
2. IC 741 Oscillator Circuit – Phase Shift Oscillator.

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	-	3	-	3	-	-	2	-	-	-	3	-
CO2	2	3	-	-	2	-	-	-	-	-	2	-	-	-
CO3	-	-	3	-	2	-	3	-	-	3	-	-	3	-
CO4	3	-	2	-	-	-	-	-	3	-	-	-	-	-
CO5	3	-	-	-	-	-	-	3	-	-	-	3	-	-
CO6	-	-	3	-	-	-	-	-	-	-	-	-	3	-

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III Year - I Semester

L T P C
0 0 2 1

Linear and Digital Integrated Circuits Lab

Minimum 10 experiments should be conducted.
{ 8 experiments from part A and 2 experiments from part B}

Pre-Requisites: EDC LAB, DLED LAB & APC LAB,

Course Outcomes: The Students will be able to

- Have a thorough understanding of operational amplifier (741).
- Design circuits using operational amplifiers for various applications.
- Design various active filters using Op amps.
- Understand various applications of 555 565 and 566 ICs.
- Demonstrate their knowledge by digital circuits.
- Design various combinational circuits using various Digital Integrated IC's.

PART- A

1. Study of OP AMPs – IC 741, IC 555, IC 565, IC 566, IC 1496 – functioning, parameters and Specifications.
2. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
3. Integrator and Differentiator Circuits using IC 741.
4. Active Filter Applications – LPF, HPF (first order)
5. Active Filter Applications – BPF, Band Reject (Wideband).
6. Schmitt Trigger Circuits – using IC 741 and IC 555
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation Circuit.
9. IC 555 Timer – Astable Operation Circuit.
10. 4 bit DAC using OP AMP

PART -B

11. 8*1 MULTIPLEXER-74151.
12. 1*8 Demultiplexer-74155.
13. Decade counter using 74LS90

Equipment required for Laboratories:

1. RPS.
2. CRO.
3. Function Generator.
4. Multimeter.
5. IC Trainer Kits (Optional).

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Serial Communication.

Pipeline and Multiprocessors: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processing, Interconnection Structures, Cache Coherence.

TEXT BOOKS:

1. Computer System Architecture – M.Moris Mano, IIIrd Edition, PHI / Pearson, 2006.
2. Computer Organization – Car Hamacher, ZvonksVranesic, SafwatZaky, V Edition, McGraw Hill, 2002.

REFERENCES:

1. Computer Organization and Architecture – William Stallings Seventh Edition, PHI/Pearson, 2006.
2. Computer Architecture and Organization – John P. Hayes, McGraw Hill International editions, 1998.
3. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
4. Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition.
5. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy.

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	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	2	-	-	3	-
CO3	2	-	3	-	-	-	-	-	2	-	-	-	-	2
CO4	3	2	3	-	-	-	-	-	-	-	-	-	3	-
CO5	2	2	3	-	2	-	-	-	-	2	-	-	-	-
CO6	2	-	3	-	-	-	-	-	-	-	-	-	-	-

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III Year - I Semester

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3	0	0	3

COMPUTER ARCHITECTURE AND ORGANISATION

PROFESSIONAL ELECTIVE - I

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Computer Fundamentals, Programming Concepts

Course Objectives:

- Understand the architecture of a modern computer with its various processing units.
- Understand the Performance measurement of the computer system.
- Understand the memory management system of computer.

Course Outcomes:

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

CO1	Gain the knowledge of the computer architecture of modern computers.
CO2	Analyse the performance of a computer using performance equations.
CO3	Identify the fundamentals of different instruction set architectures and their relationship to the CPU design.
CO4	Gain the knowledge on the memory system and multi programmed concepts.
CO5	Identify the operation of modern CPUs including interfacing, pipelining, memory systems and busses.
CO6	Gain the knowledge on the principles of operation of multiprocessor systems.

Course Content(Syllabus)

UNIT I

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.
Central Arithmetic: Data representation,Addition and Subtraction Algorithms, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations.

UNIT II

Machine Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, The role of Stacks and Queues in computer programming equation, Addressing Modes.
Type of Instructions: Basic Instruction Types, Data transfer Instructions, Arithmetic Instructions, Logical Instructions, shift and Rotate Instructions, Branch Instructions.

UNIT III

Micro Programmed Control: Control Memory, Address Sequencing, Micro Program Example, Hard Wired Control, Micro Programmed Control.
The Memory System: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

UNIT IV

TELEPHONE NETWORKS:
Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems, Numbering plan, Charging plans, In channel signalling, Common channel signalling.

PUBLIC SWITCHED DATA NETWORKS:
Connection oriented and Connection less service, Circuit switching, Packet switching, Virtual switching concepts, LAN, WAN, MAN, Internetworking.

UNIT IV

TELECOMMUNICATION TRAFFIC:
The unit of traffic, Congestion, Traffic measurement, A mathematical model, Lost call systems, Queuing systems.

INTEGRATED SERIVES DIGITAL NETWORK:
Introduction, Motivation, New services, Network and protocol architecture, Transmission channels, User network interfaces, Signaling, Numbering &Addressing, Service characterization, Internetworking, ISDN standards, Broadband ISDN.

TEXT BOOKS:

1. **Telecommunication switching system and networks** – Thyagarajan Viswanath, PHI, 2000
2. J. E Flood, **"Telecommunications Switching and Traffic Networks,"** Pearson Education, 2006
3. **Data Communication & Networking** - B.A. Forouzan, TMH, 4 Edition, 2004.
4. **Digital telephony** - J. Bellamy, John Wiley, 2nd edition, 2001.

REFERENCES:

1. **Data Communications & Networks** - Achyut. S. Godbole, TMH, 2004.
2. **Principles of Communication Systems** – H. Taub & D. Schilling, TMH, 2nd Edition, 2003.

An Engineering approach to computer networking -S.Keshav, Addison W

E-Resources:

1. www.modernelectronics.org
2. www.electronicsforyou.com
3. www.npteliitm.ac.in

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	-	-	3	-	3	-	-	-	-	3	-	-	-
CO2	2	3	-	-	2	-	-	2	-	-	-	-	3	-
CO3	-	-	3	-	2	-	-	-	3	-	-	-	-	2
CO4	-	3	2	-	-	-	-	-	-	2	-	-	3	-
CO5	3	-	3	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	3	-	-	-	3	-	-	-	-	-	-	-

Digital Fourier Analyzer, Power analyzer.

UNIT III

Oscilloscopes: CRT, Block Schematic of CRO, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits.

Special Oscilloscopes: Dual beam CRO, Dual trace oscilloscope, sampling oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT IV

Bridges: Measurement of Resistance – Wheatstone,Kelvin Bridge, Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance - Shearing Bridge. Wheat stone bridge. Wien Bridge.

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed. Basic block diagram of Data acquisition systems, single channel and multi-channel DAS.

TEXT BOOKS:

1. Electronic Instrumentation, second edition-H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques- A.D.Helfrick and W.D.Cooper, PHI, 5th Edition, 2002.

REFERENCES:

1. Electronic Instrumentation & Measuements- David A. Bell, PHI,2nd Edition,2003.
2. Electronic Measurements and Instrumentation by K.Lal Kishore, Pearson Education-2005.

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	-	-	3	-	-	-	-	-	-	-	3	-
CO2	-	3	-	-	3	-	-	3	-	3	-	-	-	-
CO3	2	-	-	-	-	-	-	-	3	-	-	3	-	-
CO4	-	-	-	2	-	3	-	-	-	-	-	-	3	-
CO5	3	3	-	2	-	-	3	-	-	-	2	-	-	2
CO6	3	-	3	-	-	-	-	-	-	-	-	-	2	-

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III Year - I Semester

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3 0 0 3

TELECOMMUNICATION SWTICHING NETWORKS
PROFESSIONAL ELECTIVE - I

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Fundamental knowledge of Analog and Digital circuits, Basic knowledge of Analog and Digital Communication, Analytical skills for communication systems and mathematical knowledge.

Course Objectives:

- To understand various switching systems.
- To learn in detail about stored program control.
- To know about time division switching concepts.
- To study the basic telephone network structures.
- To understand various internet concepts like LAN, WAN and MAN.
- To gain knowledge on telecommunication traffic and ISDN.

Course Outcomes:

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

CO1	Analyze the need for switching systems and their evolution from analog to digital.
CO2	Explore the types of stored program control.
CO3	Interpret the concepts of space switching, time switching and combination switching.
CO4	Differentiate between signalling methods used in telecommunication networks.
CO5	Exhibit good knowledge on data communication networks and be able to differentiate LAN, WAN and MAN.
CO6	Demonstrate and work on telecommunication traffic and ISDN services.

Course Content(Syllabus)

UNIT I

UNIT I:

INTRODUCTION:

Evolution of telecommunications, Basics of switching system – general principle and elements, Classification of switching system.

CROSSBAR SWITCHING:

Principles of crossbar switching, Crossbar switch configurations, Cross point technology, Crossbar exchange organization.

UNIT II

ELECTRONIC SPACE DIVISION SWITCHING:

Stored program control, Centralized SPC, Distributed SPC, Enhanced services, Two stage networks, Three stage networks, n stage networks.

TIME DIVISION SWITCHING:

Time multiplexed space switching, Time multiplexed time switching, Combination switching, Three stage Combination switching, n stage Combination switching.

UNIT III

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.

2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

3. Micro strip Antenna Design Hand Book – Ramesh Garg, Prakash Bhartia,Inder Bahl, Apisak Ittipiboon, Artech House, second edition 2001

4. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5,Standard Publishers Distributors, Delhi.

5. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.

6. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988

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
CO2	-	3	3	2	-	-	2	2	-	-	-	-	-	3
CO3	2	3	-	3	-	-	-	-	-	-	-	-	-	-
CO4	2	-	3	3	-	-	-	-	-	-	2	-	-	3
CO5	2	3	-	-	-	2	-	2	-	-	-	-	2	-
CO6	-	3	2	-	-	-	-	-	-	-	-	-		-

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III Year - I Semester

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3	0	0	3

PROFESSIONAL ELECTIVE – I
ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Electrical circuits, Electronic Devices and circuits.

Course Objectives:

- Introduce the basic concepts related to the operation of electronic measuring instruments.
- Acquire a sound understanding theory and performance characteristics of instruments and errors in measurement and apply to DC voltmeters, ammeters, ohmmeters.
- To analyze fundamental characteristics of Micro strip lines through electromagnetic field concepts.
- Compare and contrast different types of oscilloscopes.
- Select different types of D.C and A.C bridges for measurement of passive components.
- Study the principles behind various transducers and their applications in the measurement of various parameters.

Course Outcomes:

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

CO1	Understand the fundamental concepts instrumentation, basic concepts of measuring systems and characteristics of measuring systems.
CO2	Describe different types of meters and understanding the operation of meters.
CO3	Analyze Different types of signal generators and signal analyzers and their working principles.
CO4	Interpret the different types of Oscilloscopes and their working principles.
CO5	Explore the different types of A.C. and DC Bridges and their operations.
CO6	Demonstrate the different types of transducers and their principles and operations.

Course Content(Syllabus)

UNIT I

Performance Characteristics of Instruments: Block Schematic of Measuring Systems, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error, Types of Errors.

DC & AC Meters: Basic DC Voltmeter, Multi-range Voltmeters, Range extension/Solid state and differential voltmeters, AC voltmeters, Digital Voltmeters: Ramp Type, Staircase, Dual slope integrating type, Successive Approximation type, Ohmmeters series type, shunt type, Multi-meter for Voltage, Current and resistance measurements.

UNIT II

Signal Generators: fixed and variable AF oscillators, Standard AF sine and square wave signal generators, Function Generator, Square pulse, Random noise, sweep, Arbitrary waveform generator.

Wave Analyzers: Harmonic Distortion Analyzer,Spectrum Analyzer,Digital Spectrum Analyzer,

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III Year - I Semester

L	T	P	C
3	1	0	4

ANTENNAS AND WAVE PROPAGATION

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

Prerequisites: EM Waves and Transmission Lines.

Course Objectives:

- To introduce the fundamental principles of antenna theory and to apply them for the analysis, design.
- To introduce to the design principles of different antenna arrays.
- To understand the radiation mechanism of various types of antennas and also to learn about the basic parameters of antennas and their measurement.
- To understand the wave propagation over ground and through different layers of atmosphere.

Course Outcomes:

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

CO1	Understand the basic antenna radiation parameters and radiation mechanism of single wire & two wire antennas with current distribution analysis.
CO2	Quantify the radiation fields and powers radiated by dipole antennas also analyze their radiation characteristics using mathematical approach.
CO3	Illustrate the different types of arrays and their radiation patterns with both mathematical and geometrical analysis.
CO4	Understand the geometry and working principle of operation of non resonant radiators and micro strip antennas with qualitative analysis.
CO5	Design Microwave antennas also Analyze antenna measurements to assess antenna's performance.
CO6	Identify and distinguish the characteristics of different modes of radio wave propagation in the atmosphere with both qualitative and quantitative treatment.

Course Content(Syllabus)

UNIT I

Part-A (Antenna Fundamentals): Introduction, Radiation Mechanism – single wire, 2 wire. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, ,Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

Part-B(Thin Linear Wire Antennas): Retarded Potentials, Dipoles, Current Distribution on a thin wire antenna ,Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Directivity, Effective Area ..Natural current distributions and patterns of Thin Linear Center-fed Antennas of different lengths.

UNIT-II

Part-A(Antenna Arrays-I): 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity,

Directivity Relations (no derivations). Related Problems.

Part-B(Antenna Arrays-II): Concept of Scanning Arrays. Binomial Arrays, Effects of Uniform and Non-uniform Amplitude Distributions, Design Relations. Arrays with Parasitic Elements, Yagi-Uda Arrays.

UNIT III

Part-A(Non-Resonant Radiators) : Introduction, Traveling wave radiators – basic concepts, Long wire antennas –field strength calculations and patterns, Helical Antennas – Significance, Geometry, basic properties; Design considerations of helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

Part-B(Microstrip Antennas): Introduction, Definition, Basic geometry , Features, Advantages and Limitations, Different Shapes of patch elements, Rectangular Patch Antennas –Geometry and Parameters, Radiation Mechanism of Microstrip antenna. Characteristics of Microstrip antennas, Impact of different parameters on characteristics.

UNIT IV

Part-A(Microwave Antennas): Paraboloidal Reflectors – Geometry, characteristics, types of feeds, Spill Over, Back Lobes, Aperture Blocking, Cassegrain Feeds. Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Antenna Measurements – Directivity and Gain Measurements.

Part-B(Wave Propagation): Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt.Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction, Critical Frequency, MUF and Skip Distance , Optimum Woking Frequency, , Virtual Height, Ionospheric Abnormalities,. Fundamental Equation for Free-Space Propagation, Space Wave Propagation– Mechanism, LOS and Radio Horizon. Effective Earth's Radius, Duct Propagation, Tropospheric Scattering.

TEXT BOOKS:

1. Antennas and Wave Propagation– John D. Kraus and Ronald J. Marhefka, 4th Edition, TMH, 2010.

2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition.

REFERENCES:

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III Year - I Semester

L	T	P	C
3	1	0	4

DIGITAL COMMUNICATIONS

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

Prerequisites: Basics of Communications, Signals and Systems and Probability and Random processes.

Course Objectives:

1. To acquire basic knowledge of digital communication systems and its advantages.
2. To analyze various pulse digital and digital modulation techniques and their error performance.
3. To understand and analyze various source coding and channel coding techniques.

Course Outcomes:

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

CO1	Apply the knowledge of statistical theory of communication and understand the basics of digital communication systems.
CO2	Analyze the performance of digital modulation techniques for generation, detection and digital representation of the signal.
CO3	Explore the probability of error for various digital modulation techniques with the help of random variables and filters.
CO4	Integrate and apply the basics of information theory to the communication and compute entropy, information rate of the source.
CO5	Understand and analyze the source coding techniques and channel capacity.
CO6	Compute and analyze different error control coding schemes for reliable transmission of digital information over the channel.

Course Content (Syllabus)

UNIT I

INTRODUCTION TO DIGITAL COMMUNICATION:

Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems.

Differential PCM systems (DPCM), Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems.

UNIT II

Introduction, Line Codes, ASK, FSK, PSK, DPSK, DEPSK, QPSK, coherent reception, non-coherent detection, M-ary PSK, ASK, FSK.

Probability of error, the optimum filter, matched filter, probability of error using matched filter, calculation of error probability of ASK, BPSK, BFSK, QPSK.

UNIT III

INFORMATION THEORY:

Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.

SOURCE CODING:

Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT IV

LINEAR BLOCK CODES:

Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation.

CONVOLUTION CODES:

Introduction, encoding of convolution codes, Graphical approach: state, tree and trellis diagram, decoding using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005

2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003

REFERENCES:

1 Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.

2. Digital Communications – John Proakis, TMH, 1983. Communication Systems- Analog & Digital – Singh & Sapre, TMH, 2004.

3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

Contribution of Course Outcomes towards achievement of Program Outcomes (PO) and Program Specific outcomes (PSO) (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
CO2	-	3	2	-	-	2	-	-	-	-	-	-	2	-
CO3	2	-	-	3	-	-	-	-	2	-	-	2	-	-
CO4	-	2	-	2	-	-	-	-	-	3	-	-	-	3
CO5	2	-	3	-	-	-	-	3	-	-	-	2	-	-
CO6	-	3	2	-	3	-	-	-	-	-	-	-	-	2

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III Year - I Semester

L	T	P	C
3	1	0	4

Linear and Digital Integrated Circuits

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

Prerequisites: Electronic Devices & Circuits, Digital Electronics & Logic Design, and Pulse & Digital Circuits

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.
- To Design and implementation of combinational and sequential digital logic circuits.

Course Outcomes:

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

CO1	Apply Differential amplifier circuits and gains knowledge in OP-AMPs.
CO2	Differentiate and gain knowledge in various applications of O-PAMPS.
CO3	Analyze and design amplifiers and active filters using Op-amp.
CO4	Interpret the operational amplifiers with linear integrated circuits.
CO5	Understand basic digital circuits with combinatorial and sequential logic circuits.
CO6	Apply the structures of commercially available Analog & Digital integrated circuit families.

Course Content(Syllabus)

UNIT I

DIFFERENTIAL AMPLIFIERS: Introduction, DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configurations, Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies.

OP-AMPS: Introduction to OP-amp, Characteristics of OP-Amps, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp & its features, Op-Amp parameters & Measurement, Input & Output Off set voltages & currents, Slew rate, CMRR, PSRR, drift.

UNIT II

OP-AMP APPLICATIONS: Inverting and Non-Inverting amplifiers, Difference Amplifier, Instrumentation Amplifier, AC Amplifier, Differentiator and Integrator, Comparator, Triangular, Saw-tooth and Square Wave generators, Schmitt Trigger, Log and Anti log Amplifiers.

OP-AMP FILTERS: Introduction to Active Filters, Characteristics of Low pass, high pass, band pass, band reject and all pass filters. Design and analysis of Butterworth active filters--1st - 2nd order LPF, HPF,BPF,BRF and All pass filters.

UNIT III

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation and Amplitude Modulation.

D/A and A/D CONVERTERS: Introduction, Basic DAC techniques, Different types of DACs-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 and Dual Slope ADC, DAC and ADC Specifications.

UNIT IV

COMBINATIONAL LOGIC DESIGN ICs: Decoders-74x138, 74x139, Encoders-74x148 Priority Encoder, Multiplexers-74x151 MUX, Demultiplexers -74X155, Barrel shifter.

SEQUENTIAL LOGIC DESIGN ICs: 8-Bit Latch 74x373, Flip Flops-D Flip Flop74X74, JK Flip Flop74X109, Counters- 74x163 4-Bit Binary Counter, 74X163 as Modulus-N Counter, Universal Shift Register 74x194.

TEXT BOOKS:

1. 1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971
4. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.

REFERENCES:

1 Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. Operational Amplifiers & Linear ICs – David A Bell, Oxford Uni. Press, 3rd Edition
4. Fundamentals of Digital Logic Design- Stephen Brown, ZvonkoVranesic, McGrawHill

E-Resources :

1. https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.htm
2. https://www.electronics-tutorials.ws/opamp
3. https://www.elprocus.com/operational-amplifiers/
4. http://www.ee.surrey.ac.uk/Projects/CAL/seq-switching/General_seq_circ.htm
5. https://www.electronics-tutorials.ws/combination/comb_1.html

Contribution of Course Outcomes towards achievement of Program Outcomes (PO) and Program Specific outcomes (PSO)
(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	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	2	-	-	-	3	-	-	-	-	3	-
CO3	-	3	-	-	3	-	-	-	-	-	2	-	-	-
CO4	3	-	-	3	-	3	-	-	-	2	-	-	-	2
CO5	2	2	-	-	-	-	2	-	-	-	-	-	3	-
CO6	-	2	-	2	-	-	-	-	-	2	-	-	3	2

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME-NRIA 18

III 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	Linear and Digital Integrated Circuits	3	1	-	4	40	60	100	4
2	PC	Digital Communications	3	1	-	4	40	60	100	4
3	PC	Antennas and Wave Propagation	3	1	-	4	40	60	100	4
4	PE	**Professional Elective I** **i.** Electronic measurements & Instrumentation **ii.** Telecommunication Switching and Networks **iii.** Computer Architecture & Organization	3	-	-	3	40	60	100	3
5	OE	**Open Elective III**	3	-	-	3	40	60	100	3
6	MC	IPR and Patents	2	-	-	2	40	60	100	0
7	PC LAB	Linear and Digital Integrated Circuits Laboratory	-	-	2	2	40	60	100	1
8	PC LAB	Digital Communications Laboratory	-	-	2	2	40	60	100	1
9	PC LAB	VHDL Programming Laboratory	-	-	2	2	40	60	100	1
Total			**17**	**3**	**6**	**26**	**360**	**540**	**900**	**21**

III 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	PC	VLSI Design	3	1	-	4	40	60	100	4
2	PC	Digital Signal Processing	3	1	-	4	40	60	100	4
	PC	Microprocessors and Microcontrollers	3	1	-	4	40	60	100	4
4	PE	Professional Elective II i. Cellular and Mobile Communication ii. Digital System Design iii. Electromagnetic Interference & Electromagnetic Compatibility	3	-	-	3	40	60	100	3
5	OE	Open Elective IV	3	-	-	3	40	60	100	3
6	PC LAB	Microprocessors and Microcontrollers Laboratory	-	-	2	2	40	60	100	1
7	PC LAB	Digital Signal Processing Laboratory	-	-	2	2	40	60	100	1
8	PC LAB	VLSI Laboratory	-	-	2	2	40	60	100	1
		Total	**15**	**3**	**6**	**24**	**320**	**480**	**800**	**21**

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B.TECH ECE
III- I SEMESTER

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III Year - II Semester

L T P C
0 0 2 1

Digital Signal Processing Laboratory

Lecture – Tutorial:	0-0 Hours	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites: Signals and Systems, Laplace and Fourier Transforms.

Course Objectives:

- Analyze the Discrete Time Signals and Systems
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Learn the concepts of DSP Processors

Course Outcomes:

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

CO1	Apply the difference equations concept in the analysis of discrete time systems.
CO2	Understand the FFT algorithm for solving the DFT of a given signal.
CO3	Design a Digital filter (FIR&IIR) from the given specifications.
CO4	Realize the FIR and IIR structures from the designed digital filter.
CO5	Understand the Multirate Processing concepts to be used various applications (eg: Digital filter banks, sub band coding of speech signals).
CO6	Apply the signal processing concepts on DSP Processors.

LIST OF EXPERIMENTS:

All the Following Experiments should be conducted using MATLAB software.

1. Generation of Discrete time signals.
2. Computation of Linear Convolution.
3. Computation of Circular Convolution.
4. Addition of Sinusoidal signals.
5. Computation of DFT and IDFT.
6. Frequency response of IIR low pass and high pass Butterworth filter.
7. Frequency response of IIR low pass and high pass Chebyshev filter.
8. Frequency response of FIR low pass and high pass filter using Rectangular window.
9. Frequency response of FIR low pass and high pass filter using Triangular window.
10. Computation of N-Point FFT.

Experiments to be conducted beyond the syllabus

1. Implementation of Decimation and Interpolation for a Sequence/Signal.

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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	PSO1	PSO 2
CO1	2	3	-	2	-	-	-	-	-	3	-	-	-	3
CO2	-	3	-	2	-	-	-	-	-	2	-	-	-	2
CO3	3	-	3	-	3	-	-	-	-	-	2	-	-	-
CO4	-	3	3	-	-	2	-	-	2	-	-	-	2	3
CO5	2	-	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	2	-	2	-	-	-	3	-	2	-	-	3	-

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III Year - II Semester

L T P C
0 0 2 1

Microprocessors & Microcontrollers Lab

Lecture – Tutorial:	0-0 Hours	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites: Digital Electronics, Computer Architecture

Course Objectives:

- To develop assembly language program skills and providing the basic knowledge of interfacing various peripherals to 8086 microprocessor and 8051 Microcontroller.

Course Outcomes:

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

CO1	Develop the assembly language Programmers' for 8086 Microprocessor
CO2	Use the cross compiler such as MASM to verify and simulate the 8086 codes
CO3	Interfacing of various peripheral chips to 8086 microprocessor.
CO4	Develop the assembly language Programmes for 8051 Microcontroller.
CO5	Design various interfacing circuits for Real world and practical Applications.
CO6	Analyze the performance of various interface techniques for the computing circuits.

LAB EXPERIMENTS:

PART1:
MICROPROCESSOR 8086
Introduction to
MASM/TASM.

1. Arithmetic Operations - Multi byte addition and subtraction, multiplication and division, signed and unsigned operations, ASCII Arithmetic Operations.
2. Logic operations - shift and rotate, Converting packed BCD to Unpacked BCD, BCD to ASCII conversion.
3. By using string operations and instruction prefix: Move, Block, Reverse string, Sorting, Inserting, Deleting, Length of the string and string comparison.
4. Factorial on a given Number
5. Sum of square and Sum of Cubes of a given number

PART-II: INTERFACING WITH MICROPROCESSOR 8086 (Any 2 Experiments)

1. 8259-Interrupt Controller –Generate interrupt using 8259 timer.
2. 8279-Keyboard Display-write a ALP to display a string of character.
3. 8255-PPI-write ALP to generate sinusoidal wave, triangular and saw tooth wave using PPI.
4. 8251 USART Write ALP to establish communication between two processors.

PART-III: MICROCONTROLLER 8051

1. Switches and LEDs.
2. Traffic light Controller.
3. Finding No of 1's and 0's in a given 8 bit number
4. Addition of even number from a given array
5. Serial Communication

SOFTWARE REQUIRED:

1. Mentor Graphics Software / Equivalent Industry Standard Software.
2. Personal computer system with necessary software to run the programs and to implement.

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	-	-	3	-	-	3	-	-	-	-	-	3	-
CO2	-	2	-	2	-	-	-	3	-	2	-	-	-	2
CO3	-	-	3	-	-	2	-	-	2	-	3	3	-	-
CO4	2	-	-	-	-	-	-	-	-	3	-	-	2	-
CO5	-	2	-	2	3	-	2	-	-	-	2	3	-	-
CO6	-	3	-	-	-	-	-	-	-	-		-	3	-

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0 0 2 1

VLSI LABORATORY

Lecture – Tutorial:	0-0 Hours	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

Prerequisites: CMOS technology, Digital Electronic Circuits.

Course Objectives:

- Understand the physics and modeling of MOSFET.
- Fabricate steps and layout of CMOS integrated circuits.
- Analyze the performance of CMOS inverter and various circuits.
- Design CMOS circuits using various design rules.

Course Outcomes:

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

CO1	Design CMOS logic circuits.
CO2	Simulate the circuit with tanner EDA tools.
CO3	Apply the design rules to get the layout of the circuits.
CO4	Apply lambda based design rules and solve the problem in the design of CMOS logic circuits.
CO5	Design various gates, adders, encoders and flip-flops.
CO6	Understand various design rules to obtain the CMOS logic circuits.

LAB EXPERIMENTS:

VLSI LABORATORY USING EDA TOOL(SCHEMATIC AND LAYOUT DIAGRAMS)

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

1. Implementation of an inverter using CMOS logic.
2. Implementation of the universal gates using CMOS logic.
3. Implementation XOR gate using CMOS logic.
4. Full Adder using CMOS logic.
5. Full subtractor using CMOS logic.
6. Implementation of SR latch using CMOS logic.
7. Implementation of D latch using CMOS logic.
8. Design of Decoder using CMOS logic.
9. Design of Static RAM cell using CMOS logic.
10. Design of Differential Amplifier using CMOS logic.

Design of flip flop using CMOS logic.

site: Stationary EUT, Stationary Antenna, EUT-Antenna separation.

UNIT III

Radiated and Conducted Interference Measurements and ESD:

Anechoic chamber, TEM cell, GH TEM Cell, Characterization of conduction currents / voltages (CM & DM interference), Conducted EM noise on power lines, Conducted EMI from equipment, Immunity to conducted EMI detectors and measurements, ESD, Electrical fast transients / bursts, Electrical surges.

UNIT IV

Grounding, Shielding, Bonding and Cables, Connectors, Components:

Principles and types of grounding, Shielding and bonding, Power line filter design: common-mode, differential mode and combined CM and DM filters, EMI suppression cables, EMC connectors, EMC gaskets, Opto-Isolators.

TEXT BOOKS:

1. Engineering Electromagnetic Compatibility - Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.
2. Electromagnetic Interference and Compatibility IMPACT series, IIT – Delhi, Modules 1 – 9.

REFERENCES:

1. Introduction to Electromagnetic Compatibility - Ny, John Wiley, 1992, by C.R. Pal.

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	-	-	3	-	3	-	-	-	-	3	-	-	-
CO2	2	3	-	-	2	-	-	2	-	-	-	-	3	-
CO3	-	-	3	-	2	-	-	-	3	-	-	-		2
CO4	-	3	2	-	-	-	-	-	-	2	-	-	3	-
CO5	3	-	3	-	-	-	-	3	-	-	-	-	-	-
CO6	-	-	3	-	-	-	3	-	-	-	-	-	-	-

III Year - II Semester **L T P C**

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III Year - II Semester **L T P C**
3 0 0 3

PROFESSIONAL ELECTIVE - II

ELECTROMAGNETIC INTERFERENCE AND ELECTROMAGNETIC COMPATIBILITY

(EMI / EMC)

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: EM Waves & Transmission Lines, Wave Propagation, Antennas.

Course Objectives:

- To familiarize with the fundamentals that are essential for electronics industry in the field of EMI / EMC
- To understand EMI sources and its measurements.
- To understand the various techniques for electromagnetic compatibility.

Course Outcomes:

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

CO1	Understand natural and nuclear sources of EMI and its practical concerns.
CO2	Learn about electromagnetic emissions from various appliances and circuits.
CO3	Analyze the concept of electromagnetic interference and cross talk in transmission lines.
CO4	Study about various types of radiated and conducted interference measurements.
CO5	Understand about electrostatic discharge and electric surges.
CO6	Learn different types of grounding, shielding and bonding.

Course Content(Syllabus)

UNIT I

Introduction, Natural and Nuclear Sources of EMI / EMC:

Concepts of EMI/EMC and Definitions, Practical experiences and concerns, Natural and Nuclear sources of EMI, Lightning Discharge: Cloud-to-Ground Discharge, Cloud-to-Cloud Discharge, EM field produced by Lightning, Effects of Lightning Discharge on Transmission Lines, Electro Static Discharge: Charge accumulation and discharge, Model MSD waveform, ESD equivalent circuit, Radiated field from ESD.

UNIT II

EMI from Apparatus and Circuits, Open Area Test Sites:

Electromagnetic emissions: Systems, Appliances, Noise from Relays and Switches, Nonlinearities in circuits, Cross talk in transmission lines, Transients in power supply lines, Electromagnetic interference (EMI), Open area test sites measurements: Measurement of RE and RS, Open area test

UNIT-III

Part-A (Sequential Logic Design-I): Bistable Elements, Latches and Flip-Flops, Counters, Shift Registers, Clocked Synchronous State-Machine Analysis and Design, Designing State Machines Using State Diagrams.

Part-B (Sequential Logic Design-II): State-Machine Synthesis Using Transition Lists, State-Machine Design Example, Decomposing State Machines, Feedback Sequential Circuits, Feedback Sequential-Circuit Design.

UNIT-IV

Part-A(Memory and CPLDs): Read-Only Memory, Read/Write Memory, Static RAM, Dynamic RAM, Complex Programmable Logic Devices.

Part-B(FPGAs and ASICs): Field-Programmable Gate Arrays, Types of ASICs, ASIC Design flow, Economics of ASICs.

TEXT BOOKS:

1. John F. Wakerly, *"Digital Design: Principles and Practices"*, 4th edition, Pearson, 2008
2. Samir Palnitkar, *"Verilog HDL: A Guide to Digital Design and Synthesis"*, 2nd edition, Pearson, 2003
3. Enoch O. Hwang, *"Digital Logic and Microprocessor Design with VHDL"*, 1st edition, Nelson Engineering, 2007.

REFERENCE BOOKS:

1.Michael John Sebastian Smith, *"Application-Specific Integrated Circuits"*, 1st edition, Pearson, 2002
2. Charles H. Roth, *"Fundamentals of Logic Design"*, 5th edition, Cengage Learning, 2004
3. Randy H. Katz, Gaetano Borriello, *"Contemporary Logic Design"*, 2nd edition, PHI Learning, 2009

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	-	3	-	-	-	-	-	-	-	2	-
CO2	-	3	3	2	-	-	2	2	-	-	-	-	-	3
CO3	2	3	-	3	2	-	-	-	2	-	-	-	3	-
CO4	2	-	3	3	-	-	-	-	-	3	2	-	-	2
CO5	2	3	-	-	-	2	-	2	-	-	-	-	-	-
CO6	-	3	2	-	-	-	-	-	-	-	-	3	3	-

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(Accredited by NAAC with "A" Grade and ISO 9001:2015 Certified Institution)
POTHAVARAPPADU (V), (VIA) NUNNA, AGIRIPALLI (M), PIN – 521 212

III Year - II Semester

L T P C
3 0 0 3

DIGITAL SYTEM DESIGN

PROFESSIONAL ELECTIVE-II

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Digital Logic Design, Digital IC Applications.

Course Objectives:

- To learn advanced digital design concepts.
- To design digital sub-systems using Verilog HDL.
- To learn Memory, CPLDs, FPGAs and ASICs.
- To Design and implementation of combinational and sequential digital logic circuits.

Course Outcomes:

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

CO1	Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.
CO2	Have basic understanding of Memory, CPLDs, FPGAs and ASICs.
CO3	Design digital circuits and subsystems using Verilog HDL.
CO4	Analyze and design basic digital circuits with combinatorial and sequential logic circuits using Verilog VHDL.
CO5	Investigate suitable Verilog VHDL program constructs in Digital System Designs.
CO6	Apply various Digital ICs in performance evaluation for the synthesis process.

Course Content(Syllabus)

UNIT-I

Part-A (Verilog HDL-Basics) : Introduction, Overview of Digital Design with Verilog HDL,Hierarchical Modeling Concepts, Basic Concepts, Modules and Ports, Gate Level Modeling, Dataflow Modeling

Part-B (Verilog HDL-Programming): Behavioral Modeling, Tasks and Functions, Useful Modeling Techniques, Timing and Delays, User Defined Primitives, Logic Synthesis with Verilog HDL, Testbenches for verification of HDL models.

UNIT-II

Part-A (Combinational Logic Design-I): Introduction, Combinational-Circuit Analysis, Combinational-Circuit Synthesis, Programmed Minimization Methods, Timing Hazards, Circuit Timing, Decoders, Encoders, Three-State Devices.

Part-B (Combinational Logic Design-II): Multiplexers, Exclusive-OR Gates and Parity Circuits, Comparators, Adders, Subtractors, ALUs, Combinational Multipliers. Design considerations of the above combinational logic circuits.

. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.

2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.

3. Mobile cellular communication- G.Sasibhushan rao, Pearson Education.

4. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.

5. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

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	-	-	-	-	-	1	-	-	2	-	-	-	3
CO2	3	2	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	2	3	1	-	3	-	-	-	2	-	2	2	-
CO4	3	-	2	1	-	-	-	-	-	-	-	1	3	-
CO5	-	2	3	-	2	-	-	-	-	2	1	2	-	-
CO6	-	-	-	-	2	-	2	-	1	-	2	-	-	3

Interference: Co-channel Interference at the mobile unit and cell site, Design of an Omni-directional and Directional antenna systems. Non-cochannel Interference: Adjacent channel interference: Next channel interference, Neighboring channel interference, Near-End-Far-End Interference.

Frequency Management: Numbering the channels and grouping into subsets, Frequency spectrum utilization, Setup, access and paging channels, Self-location scheme at the mobile unit.

Channel Assignment: Channel assignments to cell sites and travelling mobile units, Fixed channel assignment: Adjacent-channel assignment, Channel sharing, Channel borrowing and Underlay-overlay cells, Non-fixed channel assignment algorithms.

UNIT III

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, obtaining the mobile point-to-point model (Lee Model), Phase difference between direct and ground reflected paths, General formula for mobile radio propagation between two fixed stations over water or flat open area, Land to mobile transmission over water, Foliage loss.

Cell Site and Mobile Antennas: Sum and difference patterns and their synthesis, Antennas at cell site: Omni directional and Directional antennas: Start-up and Abnormal antenna configurations, Space diversity antennas, Umbrella pattern antennas, unique situations of cell site antennas, Mobile antennas: Roof-mounted and Glass-mounted antennas, Mobile high gain antennas, Horizontally oriented and vertically oriented space-diversity antennas.

UNIT IV

Handoff and Dropped calls: Concept of Handoff, Types of handoff: Based on signal strength and based on carrier to interference Ratio, Handoff initiation, Delaying handoff, Forced handoff, Power- difference handoff, mobile assigned handoff , soft and hard handoff, cell site handoff only, Intersystem handoff, Dropped call rates introduction and formula for Dropped call rate.

Digital Cellular Systems: Global system for mobile (GSM): GSM architecture, OSI model of GSM, GSM channels, Multiple Access schemes FDMA, TDMA CDMA, OFDMA, concepts of LTE and LTE-advanced standards, 5G features and challenges.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Principles of Mobile Communications–Gordon L.Stuber, Springer International 2nd Edt. 2007.

REFERENCES:

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III Year - II Semester **L T P C**
3 0 0 3

CELLULAR AND MOBILE COMMUNICATIONS

PROFESSIONAL ELECTIVE – II

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Analog Communications, Digital Communications.

Course Objectives:

- Understand the basic cellular concepts like frequency reuse, cell splitting, cell sectoring etc., and various cellular systems.
- Understand the different types of interferences influencing cellular and mobile communications.
- Understand the concept of propagation model and the different types antennas used at cell site and mobile.
- Understand the frequency management, channel assignment, various propagation effects in cellular environment and the concepts of handoff and types of handoffs.
- Understand the architectures of GSM and 3G cellular systems.

Course Outcomes:

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

CO1	Demonstrate an understanding on cellular communication system, architecture, functioning, various standards and different evolution of cellular communication systems up to 5G.
CO2	Interpret the cellular system operation and design concepts, cell splitting.
CO3	Measure Co-Channel and Non Co-Channel interferences for various mobile radio propagation models and interpret the C/I measurements for different antenna systems.
CO4	Estimate the frequency management, channel assignment, channel sharing and channel borrowing techniques.
CO5	Understand impairments due to multipath fading channel, and designing of different antennas.
CO6	Design the Omni-directional and directional antennas used at cell sites and their synthesis methods.

Course Content(Syllabus)

UNIT I

Introduction to Cellular Mobile Systems: A basic cellular system, Performance criteria, Uniqueness of mobile radio environment: Modal of transmission medium, Mobile fading characteristics, Delay spread and Coherence bandwidth, Operation of Cellular Systems, Hexagonal shaped cells. Evolution of mobile cellular communication: different generations of mobile cellular communication (1G, 2G, 3G, 4G and beyond), 5G vision.

Elements of Cellular Mobile Radio System Design: Concept of frequency reuse channels: Frequency reuse schemes, Frequency reuse distance, Number of customers in the system, Permanent and Dynamic cell splitting, cell sectoring, Cellular structures: macro, micro, pico and femto cells.

UNIT II

DESIGN OF FIR DIGITAL FILTERS:
Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques and Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT IV

MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction, Decimation , Interpolation Sampling rate conversion ,Implementation of sampling rate converters, Applications – Sub-band Coding of Speech Signals ,Implementation of Digital Filter Banks, Trans-multiplexers.

INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education /PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002.
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House.

REFERENCES:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006.
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006.
6. Digital Signal Processing – P.Ramesh babu, Sci Tech publications.

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	2	2	-	2	-			-	-	-	-	3	-	-
CO2	2	-			3	-		2	-	-	-	-	-	3
CO3	3	3	3		-	-	3	-	-	-	2	-	2	-
CO4	3	3	-	2	-	-	-	-	3	-	-	-	3	-
CO5	2	-	3	2	-	3	-	-	-	-	-	-	-	-
CO6	-	2	-	2	-	-	-	3	-	2	-	-	-	3

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III Year - II Semester

L T P C
3 1 0 4

DIGITAL SIGNAL PROCESSING

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

Prerequisites: Signals and Systems, Laplace and Fourier Transforms.

Course Objectives:

- Analyze the Discrete Time Signals and Systems
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Know the need of Multi rate Processing
- Learn the concepts of DSP Processors

Course Outcomes:

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

CO1	Apply the difference equations concept in the analysis of discrete time systems.
CO2	Understand the FFT algorithm for solving the DFT of a given signal.
CO3	Design a Digital filter (FIR&IIR) from the given specifications.
CO4	Realize the FIR and IIR structures from the designed digital filter.
CO5	Understand the Multirate Processing concepts to be used various applications (eg: Digital filter banks, sub band coding of speech signals).
CO6	Apply the signal processing concepts on DSP Processors.

Course Content(Syllabus)

UNIT I

INTRODUCTION TO DIGITAL SIGNAL PROCESSING: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

DISCRETE FOURIER SERIES AND DISCRETE FOURIER TRANSFORMS: Properties of Discrete Fourier series, DFS representation of periodic sequences. Discrete Fourier Transforms, Properties of DFT, linear filtering methods based on DFT.

UNIT II

FAST FOURIER TRANSFORMS: Fast Fourier Transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

REALIZATION OF DIGITAL SYSTEMS: Review of Z-Transforms: Solution of difference equations using Z-transforms, System function. Building blocks of a block diagram, Basic structures of IIR systems, Transposed forms. Basic structures of FIR systems.

UNIT III

DESIGN OF IIR DIGITAL FILTERS:

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations.

Basic Peripherals and Interfacing

Semiconductor Memory Interfacing, PIO 8255, Modes of Operations of 8255, Interfacing Analog to Digiatal Data Converters, Interfacing Digital to Analog Converters, Stepper Motor Interfacing.

Programmable Peripheral Devices

Programmable Interrupt Controller 8259A, Programmable Communication Interface 8251 USART, DMA Controller 8257.

UNIT IV

8051 Microcontrollers

Introduction to Microcontrollers, Features of 8051 Controller, Architecture of 8051, Signal Description of 8051, Register Set 0f 8051, Memory Organization, Addressing Modes of 8051, Instruction Set of 8051.

Interfacing with Keyboard/Display Devices

Input/Output Pins Ports and Circuits, Timers and Counters Serial Ports, Interrupt Structure, Interrupt Priority in 8051, LED's, 7 Segment Display Unit, LCD Unit, A/D, D/A and Keyboard Interfacing.

TEXT BOOKS:

1. A. K. Ray and K.M. Bhurchandani, "Advanced Microprocessors and Peripherals", TMH, 2nd edition, 2006
2. Kenneth. J. Ayala, "The 8051 Microcontroller", 3rd Edition, Cengage Learning, 2010.

REFERENCES:

1. D. V. Hall' "Microprocessors and Interfacing", TMH, 2nd edition 2006. .
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", Pearson, 2nd Edition.
3. Barry B.Brey, "The Intel Microprocessors", PHI, 7th Edition, 2006.

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	-	3	-	-	-	2	-	-	-	-
CO2	2	2	-	2	-	-	-	3	-	-	-	-	3	-
CO3	-	3	3	-	2	-	-	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-	-	3	-	-	-	-	2
CO5	2	-	-	3	-	-	3	-	-	-	3	2	3	-
CO6	-	2	-	2	-	-	-	-	-	2	-	-	-	-

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III Year - II Semester

L T P C
3 1 0 4

MICROPROCESSORS & MICROCONTROLLERS

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

Prerequisites: Digital Electronics, Computer Organization

Course Objectives:

- To familiarize with architecture of 8086 microprocessor and 8051 microcontroller.
- To introduce the assembly language programming concepts of 8086 processor.
- To expose with various interfacing devices with 8086 and 8051.

Course Outcomes:

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

CO1	Gain the knowledge of the architecture and instruction set of 8086 Microprocessor and 8051 micro controller.
CO2	Identify a detailed s/w & h/w structure of the microprocessor and microcontroller.
CO3	Illustrate how the different peripherals are interfaced with 8086.
CO4	Interface various I/O devices to the 8051 microcontroller.
CO5	Develop 8086 and 8051 based different kinds of applications.
CO6	Design various interfacing circuits for computing peripherals

Course Content(Syllabus)

UNIT I

8086 Microprocessor

Introduction to Microprocessor, Features of 8086 Processor, Register Organization of 8086, Architecture, Memory Segmentation, Signal Descriptions of 8086.

Modes of 8086 System

Physical Memory Organization, General Bus Operation, I/O Addressing Capability, Minimum and Maximum Mode 8086 Systems and Timing Diagrams.

UNIT II

Instruction Set and Assembly Language Programming of 8086

Addressing Modes, Instruction Sets, Assembler Directives and Operators, Simple Programs Involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

Stack and Interrupts

Introduction to Stack, Stack Structure of 8086, Interrupts and Interrupt Service Routines, Interrupt Cycle of 8086,Non Maskable Interrupts, Maskable Interrupts, Interrupt Programming.

UNIT III

CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter.

UNIT III

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Switch logic, Gate logic.

Scaling Of MOS Circuits: Scaling models, Scaling factors for device parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

UNIT IV

FPGA Design: ASIC design flow, FPGA design flow, Basic FPGA architecture, FPGA Technologies, CPLD, Introduction to SoC design.

VISI Design Issues: VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems By Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited,2005 Edition.
2. VLSI Design-Black Book By Dr. K.V.K.K. Prasad, Kattula Shyamala, Kogent Learning Solutions Inc.2012 Edition.

REFERENCES:

1. VLSI Design By A.Albert Raj & T.Latha,PHI Learning Private Limited,2010.
2. VLSI Design-A.Shanthi and A.Kavita, New Age International Private Limited, 2006 First Edition.

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	-	-	-	3	3	-	-	-	-	-	-	3	2
CO2	-	-	3	2	-	-	3	-	-	-	-	3	-	-
CO3	3	3	2	-	-	-	-	2	-	-	3	-	3	-
CO4	-	2	-	-	3	-	-	3	-	3	-	-	-	2
CO5	3	2	3	-	-	-	-	-	3	-	-	-	3	-
CO6	2	3	3	-	-	-	-	-	-	-	-	3	-	-

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III Year - II Semester

L T P C
3 1 0 4

VLSI DESIGN

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

Prerequisites: Basic electrical properties of MOSFET, CMOS technology, Digital electronics circuits.

Course Objectives:

- Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.
- Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
- Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
- Understand the design for testability.
- Know the FPGA architecture and design flow, CPLD and system on chip.
- Highlight the circuit design issues in the context of VLSI technology, power calculations and clock mechanism.

Course Outcomes:

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

CO1	Understand the CMOS fabrication flow and also the electrical properties of MOS and Bi-CMOS circuit.
CO2	Know three sets of design rules with which NMOS and CMOS designs may be fabricated.
CO3	Estimate the scaling factors determining the characteristics and performance of MOS circuits in silicon.
CO4	Know about scaling of MOS circuits.
CO5	Understand the concepts of FPGA design, synthesis and different case studies.
CO6	Analyze the design for testability techniques and understand the mixed signal design, classify the power calculations, package selection and clock mechanism.

Course Content(Syllabus)

UNIT I

Introduction : Introduction to IC Technology, MOS and related VLSI Technology, Basic MOS Transistors, Enhancement and Depletion modes of transistor action, IC production process, MOS and CMOS Fabrication processes

Basic Electrical Properties Of MOS and Bi-CMOS Circuits: I_{ds} versus V_{ds} Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit, Alternative forms of pull-up, The CMOS Inverter ,Comparison between CMOS and Bipolar technologies, BiCMOS Technology.

UNIT II

MOS and Bi-CMOS Circuit Design Processes: The NMOS Inverter , Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Pass transistor, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter through one or more pass transistors.

MOS and Bi-CMOS Circuit Design Rules: MOS Layers, Realization of gates using NMOS, PMOS and CMOS technologies, Stick Diagrams, Design Rules and Layout, General observations on the lambda based Design rules, 2μm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2μm Double Metal, Double Poly

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME-NRIA 20

2020-21

I 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	HS 20A1100101	Professional Communication	3	0	0	3	30	70	100	3
2	BS 20A1100201	Engineering Mathematics – I	3	0	0	3	30	70	100	3
3	BS 20A1100203	Applied Physics	3	0	0	3	30	70	100	3
4	ES 20A1103301	Engineering Graphics	3	0	0	3	30	70	100	3
5	ES 20A1105301	Programming And Problem Solving With C	3	0	0	3	30	70	100	3
6	HS 20A1100292	Applied Physics Lab	0	0	3	3	15	35	50	1.5
7	BS 20A1105391	Programming And Problem Solving With C Lab	0	0	3	3	15	35	50	1.5
Total			15	0	6	21	180	420	600	18

I 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	HS 20A1200201	Engineering Mathematics – I	3	0	0	3	30	70	100	3
2	BS 20A1200205	Applied Chemistry	3	0	0	3	30	70	100	3
3	BS 20A1205302	Java Programming	2	0	2	4	30	70	100	3
4	ES 20A1204301	Network Analysis	3	1	0	4	30	70	100	4
5	PC 20A1202302	Basic Electrical Engineering	3	0	0	3	30	70	100	3
6	MC 20A1200801	Environmental Sciences	2	0	0	2	30	70	100	0
7	HS 20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
8	BS 20A1200294	Applied Chemistry Lab	0	0	3	3	15	35	50	1.5

9	ES 20A1202392	Basic Electrical Engineering Lab	0	0	3	3	15	35	50	1.5
10	20AI204391	Electronic Workshop Lab	0	0	3	3	15	35	50	1.5
Total			16	1	14	31	240	560	800	22

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

Head, ECE Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
Agiripalli (Mdl), Krishna Dist.

A.Y.-20-21

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URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nrili.edu.in

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

III 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	18A3105401	Advanced Data Structures	2	1	0	3	40	60	100	3
2	18A3105402	Computer Networks	2	1	0	3	40	60	100	3
3	18A3105403	Formal Languages and Automata Theory	3	0	0	3	40	60	100	3
4	PE-I	**Professional Elective-I**	3	0	0	3	40	60	100	3
5	OE-II	**Open Elective-II**	3	0	0	3	40	60	100	3
6	18A3105492	Computer Networks lab	0	1	2	3	40	60	100	1.5
7	18A3105491	Advanced Data Structures Lab	0	0	3	2	40	60	100	1.5
8	18A3101301	Basics of Civil and Mechanical Engineering	0	2	0	2	40	60*	100	1
9	18A3105791	Competitive Coding	0	0	2	2	40	60*	100	1
10	18A3105792	Seminar	0	0	2	2	40	60*	100	1
11	18A3100801	Indian Constitution	0	1	2	2	40	60*	100	0
Total			**13**	**6**	**11**	**28**	**440**	**660**	**1100**	**21**

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

H.O.D

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URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nriit.edu.in

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

III 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	18A3205401	Operating Systems	2	1	0	3	40	60	100	3
2	18A3205402	Design and Analysis of Algorithms	3	0	0	3	40	60	100	3
3	18A3205403	Compiler Design	3	0	0	3	40	60	100	3
4	PE-2	**Professional Elective -2**	3	0	0	3	40	60	100	3
5	PE-3	**Professional Elective -3**	3	0	0	3	40	60	100	3
6	18A3205404	Artificial Intelligence	3	0	0	3	40	60	100	3
7	18A3205491	Operating Systems & Unix programming Lab	0	0	2	2	40	60	100	1
8	18A3205492	R Programming lab	0	0	2	2	40	60	100	1
9	18A3205991	Aptitude and Reasoning – 2	0	0	2	2	40	60*	100	1
10	18A3205791	Hackathon	0	0	2	2	40	60*	100	1
11	18A3200791	Biology for Engineers/ Enterprising and Startup/ NSS / YOGA / Social service/ sports /games	0	2	0	2	40	60*	100	0
Total			17	3	8	28	440	660	1100	22

Code	Professional Elective -2	Code	Professional Elective -3
18A3205511	2.1 Advanced Database Management Systems	18A3205521	3.1 Computer Vision
18A3205512	2.2 UML & Design Patterns	18A3205522	3.2 Data Analytics
18A3205513	2.3 Distributed Systems	18A3205523	3.3 Software Testing Methodologies
18A3205514	2.4 Adhoc and Sensor Networks	18A3205524	3.4 Cloud Computing and Application Development

H.O.D

Head, CSE Department
NRI Institute of Technology
POTHAVARAPPADU (Vill)
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NRI INSTITUTE OF TECHNOLOGY
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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

I CSE - I SEMESTER

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

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

(CSE/IT/CSE(AI&ML)/CSE(DS))

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	20A1100101	Professional Communication	2	0	2	4	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	1	0	4	30	70	100	3
3	20A1100204	Applied Chemistry	3	0	0	3	30	70	100	3
4	20A1105392	Computer Engineering Workshop	2	0	4	6	15	35	50	3
5	20A1105301	Programming and Problem Solving Using C	3	0	0	3	30	70	100	3
6	20A1100293	Applied Chemistry LAB	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving Using CLab	0	0	4	4	15	35	50	2
8	20A1100801	Environmental Sciences	2	0	0	2	30	70*	100	0
Total			**15**	**1**	**13**	**29**	**195**	**455**	**650**	**18.5**

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

I CSE - II SEMESTER

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

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

(CSE/IT/CSE(AI&ML)/CSE(DS))

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	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200203	Applied Physics	3	0	0	3	30	70	100	3
3	20A1204301	Digital Logic Design	2	0	2	4	30	70	100	3
4	20A1205401	Oops Through Java	3	0	0	3	30	70	100	3
5	20A1205303	Data Structures	3	0	0	3	30	70	100	3
6	20A1200292	Applied Physics Lab	0	0	3	3	15	35	100	1.5
7	20A1205491	Oops Through Java Lab	0	0	4	4	15	35	100	2
8	20A1205393	Data Structures Lab	0	0	3	3	15	35	100	1.5
9	20A1200191	Communicative English	0	0	3	3	15	35	100	1.5
Total			**14**	**0**	**15**	**29**	**210**	**490**	**700**	**21.5**

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES

III CSE - I SEMESTER

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 CSE - II SEMESTER

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 CSE - II SEMESTER

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
OPEN ELECTIVES

III CSE - I SEMESTER

Code	Open Elective – 2
18A2205603	2.1 OOPS Through C++
18A2205602	2.2 Java Programming

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డిపార్ట్‌మెంట్ ఆఫ్ కంప్యూటర్ సైన్స్ అండ్ ఇంజినీరింగ్

మొదటి సంవత్సరం B.TECH ప్రోగ్రామ్ కోసం నిర్మాణం

I ఇయర్ I సెమిస్టర్

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I YEAR I SEMESTER

S.No	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	సూచనల పథకం				పరీక్ష పథకం			నం. క్రెడిట్స్
			ఎల్	టి	P/D	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A1100101	వృత్తిపరమైన కమ్యూనికేషన్	2	0	2	4	30	70	100	3
2	20A1100201	ఇంజినీరింగ్ గణితం-I	3	0	0	3	30	70	100	3
3	20A1100204	అప్లైడ్ కెమిస్ట్రీ	3	0	0	3	30	70	100	3
4	20A1105392	కంప్యూటర్ ఇంజనీరింగ్ వర్క్‌షాప్	1	0	4	5	15	35	50	3
5	20A1105301	C తో ప్రోగ్రామింగ్ మరియు సమస్య పరిష్కారం	3	0	0	3	30	70	100	3
6	20A1100295	అప్లైడ్ కెమిస్ట్రీ LAB	0	0	3	3	15	35	50	1.5
7	20A1105291	సీ ల్యాబ్‌తో ప్రోగ్రామింగ్ మరియు సమస్య పరిష్కారం	0	0	4	4	15	35	50	2
8	20A1100001	పర్యావరణ శాస్త్రాలు	2	0	0	2	30	70*	100	0
	మొత్తం		14	0	13	27	195	455	650	18.5

S.No	COURSE CODE	TITLE OF THE COURSE	SCHEME OF INSTRUCTION				SCHEME OF EXAMINATION			NO. OF CREDITS
			L	T	P/D	Total	CIA	SEA	Total	
1	20A1100101	Professional Communication	2	0	2	4	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	0	0	3	30	70	100	3
3	20A1100204	Applied Chemistry	3	0	0	3	30	70	100	3
4	20A1105392	Computer Engineering Workshop	1	0	4	5	15	35	50	3
5	20A1105301	Programming and Problem Solving With C	3	0	0	3	30	70	100	3
6	20A1100295	Applied Chemistry LAB	0	0	3	3	15	35	50	1.5
7	20A1105291	Programming and Problem Solving With C Lab	0	0	4	4	15	35	50	2
8	20A1100001	Environmental Sciences	2	0	0	2	30	70*	100	0
	TOTAL		14	0	13	27	195	455	650	18.5

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I సంవత్సరం II సెమిస్టర్

S.NO	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	సూచనల పథకం				పరీక్ష పథకం			నం. క్రెడిట్స్
			ఎల్	టి	P/D	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A1200203	ఇంజినీరింగ్ గణితం-2	3	0	0	3	30	70	100	3
2	20A1200201	అప్లైడ్ ఫిజిక్స్	3	0	0	3	30	70	100	3
3	20A1204302	డిజిటల్ లాజిక్ డిజైన్	2	0	2	4	30	70	100	3
4	20A1205403	OOPSతో జావా	3	0	0	3	30	70	100	3
5	20A1205304	డేటా నిర్మాణాలు	3	0	0	3	30	70	100	3
6	20A1200252	అప్లైడ్ ఫిజిక్స్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A1205491	OOPSతో జావా ల్యాబ్	0	0	4	4	15	35	50	2
8	20A1205393	డేటా స్ట్రక్చర్స్ ల్యాబ్	0	0	3	3	15	35	50	1.5
9	20A1200191	కమ్యూనికేటివ్ ఇంగ్లీష్ ల్యాబ్	0	0	3	3	15	35	50	1.5
మొత్తం			14	0	15	29	210	490	700	21.5

* బాహ్య మూల్యాంకనం లేదు

I YEAR II SEMESTER

S.NO.	COURSE CODE	TITLE OF THE COURSE	SCHEME OF INSTRUCTION				SCHEME OF EXAMINATION			NO. OF CREDITS
			L	T	P/D	Total	CIA	SEA	Total	
1	20A1200203	Engineering Mathematics-2	3	0	0	3	30	70	100	3
2	20A1200201	Applied Physics	3	0	0	3	30	70	100	3
3	20A1204302	Digital Logic Design	2	0	2	4	30	70	100	3
4	20A1205403	Oops Through Java	3	0	0	3	30	70	100	3
5	20A1205304	Data Structures	3	0	0	3	30	70	100	3
6	20A1200252	Applied Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1205491	Oops Through Java Lab	0	0	4	4	15	35	50	2
8	20A1205393	Data Structures Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
TOTAL			14	0	15	29	210	490	700	21.5

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STRUCTURE FOR FIRST YEAR B.TECH AI& ML PROGRAMME

(AI&ML) I YEAR 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	20A1100101	Professional Communication	2	0	2	4	30	70	100	3
2	20A1100201	Engineering Mathematics-I	3	0	0	3	30	70	100	3
3	20A1100203	Applied Physics	3	0	0	3	30	70	100	3
4	20A1105301	Programming and Problem Solving with C	3	0	0	3	30	70	100	3
5	20A1105392	Computer Engineering Workshop	1	0	4	5	15	35	50	3
6	20A1105391	Programming and Problem Solving with C Lab	0	0	4	4	15	35	50	2
7	20A1100292	Applied Physics Lab	0	0	3	3	15	35	50	1.5
8	20A1100801	Environmental Sciences	2	0	0	2	30	70*	100	0
TOTAL			14	0	13	27	195	455	650	18.5

I 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	20A1200201	Engineering Mathematics-II	3	0	0	3	30	70	100	3
2	20A1200205	Applied Chemistry	3	0	0	3	30	70	100	3
3	20A1261401	Introduction to Artificial Intelligence	3	0	0	3	30	70	100	3
4	20A1205401	Oops Through Java	3	0	0	3	30	70	100	3
5	20A1205303	Data Structures	3	0	0	3	30	70	100	3
6	20A1200294	Applied Chemistry Lab	0	0	3	3	15	35	50	1.5
7	20A1205491	Oops Through Java Lab	0	0	4	4	15	35	50	2
8	20A1205393	Data Structures Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
TOTAL			15	0	13	28	210	490	700	21.5

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III CSE - 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	18A3105401	Advanced Data Structures	2	1	0	3	40	60	100	3
2	18A3105402	Computer Networks	2	1	0	3	40	60	100	3
3	18A3105403	Formal Languages and Automata Theory	3	0	0	3	40	60	100	3
4	PE-I	**Professional Elective-1**	3	0	0	3	40	60	100	3
5	18A3105601 18A3105602	**Open Elective-II** 1. Oops through Java 2. Oops through C++	3	0	0	3	40	60	100	3
6	18A3105492	Computer Networks lab	0	1	2	3	40	60	100	1.5
7	18A3105491	ADS Lab	0	0	3	2	40	60	100	1.5
8	18A3101301	Basics of Civil and Mechanical Engineering / Swayam/NPTEL **	0	2	0	2	40	60*	100	1
9	18A3105791	Competitive Coding	0	0	2	2	40	60*	100	1
10	18A3105792	Seminar	0	0	2	2	40	60*	100	1
11	18A3100801	Indian Constitution	0	1	2	2	40	60*	100	0
Total			**13**	**6**	**4**	**23**	**440**	**660**	**1100**	**21**

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

* No External Evaluation

Students can opt any one of the self-learning courses from approved online platforms viz., Swayam/NPTEL/MOOCS and produce the course completion certificate before the commencement of III-II Academic session. **The course has to be completed in a stipulated time.

III CSE - 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	18A3205401	Operating Systems	2	1	0	3	40	60	100	3
2	18A3205402	Design and Analysis of Algorithms	3	0	0	3	40	60	100	3
3	18A3205403	Compiler Design	3	0	0	3	40	60	100	3
4	PE-2	**Professional Elective -2**	3	0	0	3	40	60	100	3
5	PE-3	**Professional Elective -3**	3	0	0	3	40	60	100	3
6	18A3205404	Artificial Intelligence	3	0	0	3	40	60	100	3
7	18A3205491	Operating Systems & Unix programming Lab	0	0	2	2	40	60	100	1
8	18A3205492	R Programming lab	0	0	2	2	40	60	100	1
9	18A3205991	Aptitude and Reasoning – 2	0	0	2	2	40	60*	100	1
10	18A3205791	Hackathon	0	0	2	2	40	60*	100	1
11	18A3200791	Biology for Engineers/ Enterprising and Startup/ NSS / YOGA / Social service/ sports /games	0	2	0	2	40	60*	100	0
Total			**17**	**3**	**8**	**28**	**440**	**660**	**1100**	**22**

Code	Professional Elective -2	Code	Professional Elective -3
18A3205511	2.1 Advanced Database Management Systems	18A3205521	3.1 Computer Vision
18A3205512	2.2 UML & Design Patterns	18A3205522	3.2 Data Analytics
18A3205513	2.3 Distributed Systems	18A3205523	3.3 Software Testing Methodologies
18A3205514	2.4 Adhoc and Sensor Networks	18A3205524	3.4 Cloud Computing and Application Development

* No External Evaluation

III - I Courses

Course Code-Advanced Data Structures

Lecture – Tutorial- Practical:: 2-1-0 **Internal Marks:** 40

Credits: 3 **External Marks:** 60

Prerequisites: Data Structures, Programming with C

Advance Data Structures

Course Objectives:

Describe and implement a variety of advanced data structures (hash tables, priority queues, balanced search trees, digital search trees).

Analyze the space and time complexity of the algorithms studied in the course.

Identify different solutions for a given problem; analyze advantages and disadvantages to different solutions.

Course Outcomes:

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

CO1	Able to understand the importance, operations and application of Hashing
CO2	Able to understand implementation of skip lists
CO3	Able to get a good understanding about different balanced trees.
CO4	Able to understand the implementation of heaps and binomial queues.
CO5	Have an idea on applications of algorithms in a variety of areas, like string matching, indexing etc.
CO6	Able to understand the importance and applications of tries

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	-	-	-	-	-	-	-	-
CO3	-	2	3	2	2	-	-	-	-	-	-	-
CO4	2	3	2	2	2	-	-	-	-	-	-	2
CO5	2	2	-	3	3	-	-	-	-	-	-	-
CO6	-	2	3	3	-	-	-	-	-	-	-	2

UNIT I : Hashing and Skip Lists

Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Hash Table Restructuring, Skip Lists, Analysis of Skip Lists.

UNIT II: Balanced Trees

AVL Trees: Maximum Height of an AVL Tree, Insertions and Deletions. 2-3 Trees : Insertion, Deletion, applications, introduction to Red-black trees

UNIT III: Priority Queues

Binary Heaps : Implementation of Insert and Delete min, Creating Heap.
Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy Binomial Queues

UNIT IV: Pattern matching and Tries

Pattern matching algorithms- the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm
Tries: Definitions and concepts of digital search tree, Binary trie, Patricia , Multi-way trie

TEXT BOOKS:

1. Fundamentals of DATA STRUCTURES in C: 2 nded, , Horowitz , Sahani, Anderson-freed, Universities Press.
2. Data structures and Algorithm Analysis in C, 2 nd edition, Mark Allen Weiss, Pearson

REFERENCE BOOKS:

1. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan,Cengage.
2. Introduction to Algorithms, 3rd Edition by *Thomas H.* Cormen , *Charles E. Leiserson, Ronald L. Rivest, Clifford Stein*

E-RESOURCES:

1. Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3.http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4.http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

Course Code- COMPUTER NETWORKS

Lecture–Tutorial- Practical:	2-1-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Basics of Data Communication

Course Objectives:

1. Understand state-of-the-art in network protocols, architectures, and applications.
2. Process of networking research
3. Constraints and thought processes for networking research
4. Problem Formulation—Approach---Analysis

Course Outcomes:

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

CO1	Able to understand OSI and TCP/IP models.
CO2	Able to design applications using internet protocols.
CO3	Understand routing and congestion control algorithms.
CO4	Understand how the internet works.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	2	-	-	-	-	-	-	-
CO2	3	3	3	2	3	2	-	-	-	-	-	-
CO3	3	3	3	2	2	2	2	-	-	-	-	-
CO4	3	2	2	2	2	-	2	2	-	-	-	-

UNIT I: Introduction

Introduction to Computer Networks, Network Hardware and Software, Network Topologies, The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.

UNIT II: The Data Link Layer

The Data Link Layer Design Issues, Error Detection, and Correction- Error-Correcting Codes, Error Detecting Codes, Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocols.

MAC Sub-Layer: Channel Allocation Methods, Multiple Access Protocols, CSMA Protocols, Collision Free Protocols

UNIT III: The Network Layer

The Network Layer Design Issues, Routing Algorithms- The Optimality Principle, Shortest Path, Distance Vector Algorithms, Congestion Control Algorithms- Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling, Load Shedding, The Network Layer in the Internet- IP Addresses, The IP Version 4, 6 Protocols.

UNIT IV: The Transport And Application Layers

Transport Layer- The Internet Transport Protocols- TCP, UDP.

Application Layer-The Domain Name System, Electronic Mail.

TEXT BOOKS:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010.

REFERENCE BOOKS:

1. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education.
2. Computer Networks, 5ed, David Patterson, Elsevier.
3. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A Systems Approach" 5th Edition, Morgan Kaufmann/Elsevier, 2011.
4. Computer Networks, Mayank Dave, CENGAGE.
5. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
6. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

E-RESOURCES:

1. http://www.uoitc.edu.iq/images/documents/informatics-institute/exam_materials/Computer%20Networks%20-%20A%20Tanenbaum%20-%205th%20edition.pdf
2. https://www.slideshare.net/pawan1809/computer-networks-a-tanenbaum-5th-editionee
3. https://www.technolamp.co.in/2010/08/computer-networks-tanenbaum-powerpoint.html
4. http://citengg.blogspot.com/p/behrouz-forouzancomputer-networks4th.html
5. https://www.youtube.com/watch?v=O--rkQNKqls&list=PLbRMhDVUMngf-peFloB7kyiA40EptH1up

Course Code- Formal Languages and Automata Theory

Lecture –Tutorial- Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: The students are expected to have a strong background in the fundamentals of discrete mathematics (symbolic logic, set, induction, number theory, summation, series, combinatorics, graph, recursion, basic proof techniques, etc.), algorithms and data structures. Some knowledge of programming languages, programming, and computer architecture will be helpful

THEORETICAL FOUNDATIONS OF COMPUTATION

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.

Course Outcomes:

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

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	2	-	-	-	2
CO2	2	2	3	2	2	2	2	-	-	-	2	2
CO3	2	3	3	2	2	2	-	-	-	-	2	2
CO4	3	2	2	2	3	-	2	2	-	-	2	-
CO5	3	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): 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.

REGULAR GRAMMARS: 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): Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's, Minimization of CFG's, CNF, GNF, Pumping Lemma for CFL's, Enumeration of Properties of CFL (Proof's omitted). Applications of CFG

UNIT IV:

Push Down Automata(PDA)

Languages of PDA Acceptance by final state, empty stack and conversion. Equivalence of PDA's and CFG's, Deterministic Push Down Automata.

Turing Machines(TM)

Definition, Notation, Instantaneous Description and Languages, Design of TM's, Extension of Basic TM: Multitape TM, Restricted TM, Semi-infinite tape Machines, Multi-stack TM. Introduction to undecidable problems, Post-correspondence Problem.

TEXT BOOKS:

1. "Introduction to Automata Theory, Languages and Computation" by John E. Hop croft, Rajeev Motwani, Jeffrey D.Ullman: 3rd Edition, Pearson education, 2007.

REFERENCE BOOKS:

1. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.
2. Introduction to Languages and Automata Theory" by John C Martin, 3rd Ed, Tata McGraw-H 2007.
3. "An Introduction to formal Languages and Automata" by Peter Linz,Narosa publishing house, II edition, 1997

E-RESOURCES:

1. Foundations of Computation-CAROL CRITCHLOW, DAVID ECK
2. Introduction to Theory of Computation- Anil Maheshwari,Michielsmid-carleton University-2012

MOOCs:

1. www.nptel/videos.in/2012/11/theory-of-computation.html
2. nptel.ac.in/courses/106104028/theory of computation.

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 – 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 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/

Course Code-Computer Networks Lab

Lecture – Tutorial- Practical::	0-1-2	**Internal Marks:**	40
Credits:	1.5	**External Marks:**	60

Prerequisites: Knowledge of C Programming, Basic commands of UNIX.

Knowledge of C Programming, Basic commands of UNIX

Course Objectives:

The object of this course is to provide hands-on practice on implementing different network related commands (likenetstat, ping, arp, telnet, etc.,) and programming (like socket programming, routing algorithms, etc.,) in C programming and Java.

Course Outcomes:

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

CO1 Should be able to Calculate Data link layer farming methods like bit stuffing and byte stuffing.

CO2 Should be able to Analyze Cyclic redundancy check on different polynomials.

CO3 Should be able to understand Socket Programming Implementation by using TCP and UDP Protocols.

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	2
CO3	3	-	-	2	2	-	-	-	-	-	2	2

List of Programs

1. Understanding and using of commands like ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois etc. Usage of elementary socket system calls (socket (), bind(), listen(), accept(),connect(),send(),recv(),sendto(),recvfrom()).
2. Implementation of Connection oriented concurrent service (TCP).
3. Implementation of Connectionless Iterative time service (UDP).
4. Implementation of Select(),of getpeername () system call.
5. Implementation of gesockopt (), setsockopt () system calls.
6. Implementation of remote command execution using socket system calls.
7. Implement the data link layer framing methods such as character stuffing and bit stuffing.
8. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
9. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
10. Implementation of Distance Vector Routing Algorithm.
11. Implementation of SMTP.
12. Implementation of FTP.

Note: Implement programs 2 to 6 in C and 8 to 12 in JAVA.

TEXT BOOKS:

1.Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010.
2.Computer Networks: A Top Down Approach, Behrouz A. Forouzan , FirouzMosharraf, McGraw Hill Education.

E-RESOURCES:

- http://www.softpanorama.org/Internals/unix_system_calls.shtml
- https://www.tutorialspoint.com/system-calls-in-unix-and-windows

Course Code-Advanced Data Structures Lab

Lecture – Tutorial- Practical:: 0-0-3 | **Internal Marks:** 40

Credits: 1.5 | **External Marks:** 60

Prerequisites:

Data Structures, Programming with C

Course Objectives:

Describe and implement a variety of advanced data structures (like hash tables, priority queues, balanced search trees, digital search trees).

Analyze the space and time complexity of the algorithms studied in the course.

Identify different solutions for a given problem; analyze advantages and disadvantages of different solutions.

Course Outcomes:

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

CO1	Implement Hashing
CO2	Students able to implement programs on skip lists
CO3	Implement different balanced trees.
CO4	Implement heaps and binomial queues.
CO5	Implement various string matching algorithms
CO6	Implement different search trees

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	-	-	-	-	-	-	-
CO2	2	2	2	2	2	-	-	-	-	-	-	-
CO3	2	2	3	2	2	-	-	-	-	-	-	-
CO4	2	3	2	2	2	-	-	-	-	-	-	2
CO5	2	2	-	3	3	-	-	-	-	-	-	-
CO6	-	2	3	3	-	-	-	-	-	-	-	2

List of Experiments

1. Program To implement functions of Dictionary using static Hashing
2. Program To implement functions of Dictionary using dynamic Hashing
3. Program To implement Skip Lists
4. Program To perform various operations i.e., insertions and deletions on AVL trees.
5. Program To perform various operations i.e., insertions and deletions on 2-3 trees.
6. Program To implement operations on binary heap.
7. Program To implement operations on Binomial Queue.
8. Program To implement pattern matching using Boyer-Moore algorithm.
9. Program To implement Knuth-Morris-Pratt algorithm for pattern matching.
10. Program To implement Digital Search Tree.
11. Program To implement PATRICIA.

Course Code- Basics of Civil and Mechanical Engineering

Lecture – Tutorial- Practical::	0-2-0	**Internal Marks:**	40
Credits:	1	**External Marks:**	60*

Prerequisites:

1. Learn about the engineering materials, their types, properties and applications.
2. Study the basic manufacturing processes used in manufacturing of products.
3. Understand the concepts of engineering mechanics like analysis of coplanar concurrent systems.
4. Understand the fundamental principles of thermodynamics.

Course Outcomes:

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

CO1	Understand the concepts of force and friction, direction and its application & able to demonstrate the basic surveying skills
CO2	Identify different building materials and their importance in building construction.
CO3	Differentiate brick masonry, stone masonry and types of flooring & roofing.
CO4	Familiarize with the Engineering materials, their types, properties and applications.
CO5	Familiarize with the basic manufacturing processes used in manufacturing of products.
CO6	Analyze coplanar concurrent systems and Familiarize with fundamental principles of thermodynamics.

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	-	-	-	-
CO2	2	-	-	-	-	-	-	2	-	-	-	-
CO3	2	-	-	-	-	-	-	2	-	-	-	-
CO4	3	1	1	-	-	-	-	-	-	-	-	3
CO5	3	2	1	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

UNIT I :

UNIT – I

SIMPLE STRESS AND STRAINS:

Definition of Mechanics- External and Internal forces-Stress and Strain-Elasticity and Hooke's Law-Relations between elastic constants.

SURVEYING:

Objectives, Types, Principles of Surveying; Measurement of distances and angles

UNIT II:

CIVIL ENGINEERING MATERIALS:

Classification of bricks, Manufacture of bricks, Laboratory and field tests on bricks, stones; Grades of Steel and Cement Concrete.

MASONRY:

Bonds inBrick Masonry, Stone Masonry; Types of Flooring and Roofing.

UNIT III:

Introduction to Engineering materials:

Engineering materials, classification - Properties and applications of Metals: Ferrous and Non-ferrous; Non-metals: Glasses- Ceramics; Polymers: PVC &HDPV;Biomaterials- Composite materials.

Basic Manufacturing Processes: Casting: Classification, Steps involved in making a casting - Advantage of casting and its applications. Welding: Classification of welding processes, Fundamental treatment of various welding processes, Soldering and Brazing.

UNIT-IV

System of forces: Types of Force systems - Coplanar Concurrent Forces - Resultant - Moment of a Force -Resultant of a Force System -Conditions of Equilibrium - Equilibrium analysis of Coplanar Force Systems -Free body diagrams.

Fundamentals of Thermodynamics: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, Zeroth Law of Thermodynamics - Concept of quality of Temperature. First law of Thermodynamics, First law applied to Non flow systems-simple problems,

TEXTBOOKS:

1. Thermal Engineering, R.K.Rajput, Laxmi publications.
2. A text book of Material science and metallurgy – O.P. Khanna/ Dhanpat rai publications.
3. Engineering Mechanics – Statics and Dynamics - A. K. Tayal, Umesh Publications.
4. Elements of Manufacturing Processes - PARASHAR, B.S. NAGENDRA, MITTAL,
5. Engg. Mechanics - S.Timoshenko&D.H.Young., 4th Edn - , Mc Graw Hill publications.
6. Building Materials, S. S. Bhavikatti, Vices publications House private ltd.
7. Surveying and levelling, R. Subramanian, Oxford University press

REFERENCE BOOKS:

1. Thermodynamics – An Engineering Approach – YunusCengel& Boles /TMH
2. Engineering Mechanics, SS Bhavikatti& KG Rajasekharappa, New Age International
3. Materials Science and Metallurgy – C. Daniel Yesudian, D. G. Harris Samuel.
4. Production Technology, K.L.Narayana, S.V.Ramana& P. Vamsi Krishna, first edition, I.K. Books
5.Engineering Thermodynamics / PK Nag /TMH International, 2006.
6.Production Technology Vol.I, O.P. Khanna & M. Lal, Dhanpat Rai Publicati
7.Building Materials, S. K. Duggal, New Age International Publications
8.Fundamentals of surveying, S.K. Roy – PHI learning (P) ltd.

E-RESOURCES:

1. https://nptel.ac.in

COURSE CODE-COMPETITIVE CODING

Lecture – tutorial- practical::	0-0-2*	Internal marks:	40
Credits:	1	External marks:	60*

Prerequisites: data structures, any programming language (C/C++/JAVA/PYTHON)

Competitive Coding:

The focus of the course is the development and implementation of algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms, and implement them in c/c++/java/python. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure. Students are expected to complete coding of allotted task by the instructor. The instructor may choose fixed number of programs among the given programs in the unit for each student. The choice of programs for a student in a unit is random. The student is allotted 25 marks after successful execution of allotted programs of each unit.

Course objectives:

- To impart knowledge of designing solutions to print various pattern or shapes.
- Be familiar with various number based problems and their solutions.
- To understand problem concepts based on arrays and design solutions.
- Be familiar with functions, recursion and to design the implementation of solutions based on recursion.
- To learn and develop solutions for problems on pointers.
- To understand and apply solutions based on linked lists, stacks and queues.

Course outcomes:

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

CO1	Understand and design solutions for problems based on various printing patterns/shapes
CO2	Understand the basic principles of various number based problems and design solutions
CO3	Apply appropriate algorithm design technique to solving array based application problems
CO4	Identify suitable method to solve problems based on functions and recursion
CO5	Understand and solve problems based on pointers
CO6	Analyze and design solutions based on linked lists, stacks and queues.

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	3	-	-	3	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	3	-	-	-	-	-	-	3
CO5	3	3	-	-	3	-	-	-	-	-	-	3
CO6	3	3	-	-	-	-	-	-	-	-	-	3

Unit I :

Basic problems:

Pattern based problems, triangle pattern, diamond shapes, Pascal shape, Floyd triangle, etc.

Number based problems prime, Armstrong, Strong, Perfect, palindrome, Kaprekar numbers etc.

Code the following

1. Print the multiplication table of a given number up to a another specific number
2. Find m power n
3. Find out generic root of a number by c program
4. Sum of Prime factors of a number
5. Display the factors of a given number
6. Find whether given number is Armstrong or not?
7. Find whether given number is Perfect or not?
8. Find whether given number is Strong or not?
9. Find whether given number is Palindrome or not?
10. Find whether given number is Kaperkar or not?
11. Print following patterns

1.

```
5
5 4
5 4 3
5 4 3 2
5 4 3 2 1
```

2.

```
1
2 3
4 5 6
7 8 9 10
```

3.

```
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1
```

4.

```
    *
   * * *
  * * * * *
 * * * * * * *
* * * * * * * * *
* * * * * * * * *
 * * * * * * *
  * * * * *
   * * *
    *
```

5.

```
3
44
555
6666
555
```

44
3

6. 1
3*2
6*5*4
10*9*8*7

12. Find nth Prime
13. Find first n primes
14. Find 1 to n primes
15. Find whether given number is perfect square or not?

Unit II:

Array based problems (one dimensional and two dimensional) – segregation-making two lists from one list making three lists from one list, list searching techniques, various sorting, special series problems, matrix printing in spiral order, matrix diagonal printing, maze problems, etc.

Character and string based problems – removal of spaces, word reverse in sentence, reverse sentence without reversing words, making string shortest possible palindrome, etc.

Code the following

1. Conversion from uppercase to lower case using c program
2. Counting different characters in a string using c program
3. Code which prints initial of any name
4. Segregate 0's& 1's in a list. Segregate 0's,1's& 2's in an array. Segregatepositive and negative numbers in an array.
5. Find the second last index occurrence of a number in list of elements and if the given number does not occur twice, display -1.
6. Longest sub sequence in an array
7. Find the only number which occurs odd number of times in an array (where all other numbers are even) without counting.
8. Remove duplicates from sorted array
9. Print a given matrix in spiral form Given a 2d array, print it in spiral form. See the following examples.
   Please comment down the code in other languages as well below –
   Input:
   1 2 3 4
   5 6 7 8
   9 10 11 12
   13 14 15 16
   Output:
   1 2 3 4 8 12 16 15 14 13 9 5 6 7 11 10
   Input:
   1 2 3 4 5 6
   7 8 9 10 11 12
   13 14 15 16 17 18
   Output:
   1 2 3 4 5 6 12 18 17 16 15 14 13 7 8 9 10 11
10. Print the following pattern

Testcase 1:

1 1 1 1 1 1 2
3 2 2 2 2 2 2
3 3 3 3 3 3 4
5 4 4 4 4 4 4
5 5 5 5 5 5 6
7 6 6 6 6 6 6

Testcase 2:

1 1 1 2
3 2 2 2
3 3 3 4

11. Zigzag (or diagonal) traversal of Matrix

Given a 2D matrix, print all elements of the given matrix in diagonal order. For example, consider the following 5 X 4 input matrix.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20

Diagonal printing of the above matrix is

1 5 2 9 6 3 13 10 7 4 17 14 11 8 18 15 12 19 16 20

12. Check for Matrix Symmetry
13. Removal of spaces in a string
14. Reverse words in sentence. Reverse sentence without reversing words
15. Make a string shortest possible palindrome

Unit III:

Functions and recursion, pointer based problems, function pointers and array pointers

1. Write a c program to print Fibonacci series of given range.
2. Consider the below series : 0,0,2,1,4,2,6,3,8,4,10,5,12,6,14,7,16,8
   This series is a mixture of 2 series all the odd terms in this series form even numbers in ascending order and every even terms is derived from the previous term using the formula (x/2)
   Write a program to find the nth term in this series.
   The value n in a positive integer that should be read from stdin the nth term that is calculated by the program should be written to stdout. You can assume that the n will not exceed 20,000.
3. Consider the following series: 1,1,2,3,4,9,8,27,16,81,32,243,64,729,128,2187…
   This series is a mixture of 2 series – all the odd terms in this series form a geometric series and all the even terms form yet another geometric series. Write a program to find the nth term in the series.
   The value n in a positive integer that should be read from stdin. The nth term that is calculated by the program should be written to stdout. May consider that n not greater than 30.
4. There is a colony of 8 houses represented as cells arranged in a straight line. Each day every cell competes with its adjacent cells (neighbours). Each day, for each cell, if its neighbours are both active or both inactive, the cell becomes inactive the next day,. Otherwise it becomes active the next day.
   Assumptions: the two cells on the ends have single adjacent cell, so the other adjacent cell can be assumed to be always inactive. Even after updating the cell state, consider its pervious state for updating the state of other cells. Update the cell information of all cells simultaneously.
   Write a function cellcompete which takes one 8 element array of integers cells representing

the current state of 8 cells and one integer days representing the number of days to simulate. An integer value of 1 represents an active cell and value of 0 represents an inactive cell.

5. The least recently used (lru) cache algorithm exits the element from the cache that was least recently used when the cache is full. After an element is requested from the cache, it should be added to the cache (if not there) and considered the most recently used element in the cache whether it is newly added or was already existing. Initially, the cache is empty. Implement the function lrucountmiss shall consist of an integer max_cache_size, an array pages and its length len and the function returns an integer indicating the number of cache misses m using the lru cache algorithm execution for the given input. Assume that the array pages always have pages numbered from 0 to 50. (a hit means the requested page is already existing in the cache and a miss means the requested page is not found in the cache). Input format: cache size s, the n pages being requested from the cache and the number of page requests n separated by a space.
6. Print palindrome from num to given number of digits when num is less than the max of given number of digits in the following pattern otherwise print "invalid"
   Input:
   3 2
   [4,5,6,7,8,9,11,22,33,44,55,66,77,88,99]
7. Sandwich pattern
   Input:
   5
   Output:
   1 *2 *3 *4 *5
   11 *12 *13 *14 *15
   21 *22 *23 *24 *25
   16 *17 *18 *19 *20
   6 *7 *8 *9 *10

   Input: 6
   Output:
   1 *2 *3 *4 *5 *6
   13 *14 *15 *16 *17 *18
   25 *26 *27 *28 *29 *30
   31 *32 *33 *34 *35 *36
   19 *20 *21 *22 *23 *24
   7 *8 *9 *10 *11 *12

8. TRAPEZIUM PATTERN
   INPUT:
   4
   OUTPUT:
   1*2*3*4*17*18*19*20
   5*6*7*14*15*16
   8*9*12*13
   10*11
9. Longest Increasing Subsequence using Longest Common Subsequence Algorithm
10. Number of sub arrays with negative product Array is {-1,2,-2} No. of negative products are 4.

Unit IV:

Linked lists, Queues, Stack, Graph and tree based problems

1. Merge two sorted lists into third list
2. Implement Queue using Stack
3. Implement Stack using Queue
4. Reverse linked list without using extra space
5. Sort the linked list without using extra space
6. Intersection of two linked lists
7. Swap pair wise nodes in Linked Lists
8. Count of triples (A, B, C) where A*C is greater than B*B, where A, B and C are integers.
9. Design an Algorithm to find articulation point of a tree.
10. Convert a graph to a tree

Text books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, And Clifford Stein, Introduction To Algorithms, First Or Second Edition, Mcgraw Hill.
2. Data Structures And Algorithmic Thinking With Python, By NarasimhaKarumanchi, Careermonk Publications
3. Dynamic Programming For Coding Interviews. A Bottom-Up Approach To Problem Solving, By Meenakshi& Kamal Rawat, Notion Press

Reference Books:

1. Cracking The Coding Interview 6th Edition
2. Guide To Competitive Programming: Learning And Improving Algorithms Through Contests (Undergraduate Topics In Computer Science) Springer

E-resources:

www.andrew.cmu.edu/course/15-295,
https://cses.fi/book/book.pdf.
https://www.comp.nus.edu.sg/~stevenha/myteaching/
https://www.javatpoint.com/programs-list
https://practice.geeksforgeeks.org/

SEMINAR

Lecture – tutorial- practical::	0-0-2*	Internal marks:	40
Credits:	1	External marks:	60*
Prerequisites:			

Learning Outcomes

1. To expose students to a variety of current or emerging topics/research publications and provide them with the opportunity of good public seminars.
2. To attain confidence and comfort on the podium requires practice
3. To learn, practice, and critique effective scientific seminar skills.
4. To develop presentation skills that will be essential during their entire professional careers.
5. To practice within the friendly confines of the department, observed by the faculty and peers

Course outcomes:

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

CO1	To enable the students experience and reflect upon their own thinking as it is expressed in communication with others.
CO2	To Examine various newspapers, magazines, articles and books, journals, the web, and other instances of contemporary expression so as to discern genuine thinking from the spurious.
CO3	To learn to work on oral skills like conversational practices, extempore and role play
CO4	To learn the oral presentation techniques(planning preparation practice and presenting)
CO5	To improve presentation skills and develop confidence level in students
CO6	To inculcate the scientific analysis and research on various research topics and get good critical thinking and understanding.

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
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3
CO6	3	3	-	-	-	-	-	-	-	-	-	3

Course Outline

In this course, student will participate in five activities that will hone their oral presentation skills: observation, question, critique, research, and presentation.

Observation: One of the most effective means of gaining an appreciation for the art of presentation is to observe the performance of others. The mannerisms and appearance, the voice, and the visual aids employed by a speaker may be viewed in light of what works and what

doesn't. Students learn by example.

Question: The formulation of relevant questions that probe a speaker's knowledge, experimental methods, assumptions, and interpretations is an important part of any presentation, and of the scientific method.

Critique: The critique offers the opportunity for observers to indicate to the presenter (1) areas within the presentation that were well-done, and (2) areas within the presentation that could be improved upon.

Research: It is an expectation and goal of the CSE faculty that this seminar series will be a forum for our students and faculty to dispense and gain insight into the current and cutting edge activities in engineering and technology. To meet these expectations, you will be required to research on current topics/Research publications and develop a presentation.

Presentation: Public speaking is not normally a pleasant experience, particularly for those who are new to the activity; but, it can become so. To attain confidence and comfort on the podium requires practice. This allows students the opportunity to practice within the friendly confines of the department, observed by the faculty and your peers. Students will be responsible for developing and delivering a seminar presentation on a topic that is within one of the discipline areas in the department.

In general, students are expected to create and deliver the following three presentations in the semester.

Series 1 : A power point presentation on any technical topic/text of student's choice. The length of your presentation will be 15 to 20 minutes, followed by a 5 to 10 minutes for questions.

Series 2 : : The learner will be an active and engaged participant by analyzing, constructing/creating, and evaluating information presented in technical and/or scientific journals. The length of the power point presentation will be 15 to 20 minutes, followed by a 5 to 10 minutes for questions.

Series 3 : The learner will conduct a 5 minute video presentation to be delivered based upon a journal article.

Note : 1. Students have to create presentations on their own and downloaded/copied presentations will be severely dealt.

2. Students will have to submit a one page write up to the coordinator at least one week in advance.

3. The write up format will be circulated by the course coordinator.

INDIAN CONSTITUTION

Type of Course : Audit Course

Lecture – Tutorial-Practical::	0-1-2*	**Internal Marks:**	40
Credits:	0	**External Marks:**	60*

Prerequisites:

Course Objectives:

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 Statesand Indian President.
CO4	Know about amendments of the constitution and Emergency Provisions

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

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

- Scheme of the fundamental rights
- The scheme of the Fundamental Duties and its legal status
- The Directive Principles of State Policy – Its importance and implementation

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

UNIT IV

- Amendment of the Constitutional Powers and Procedure
- The historical perspectives of the constitutional amendments in India
- Emergency Provisions : National Emergency, President Rule, Financial Emergency

Reference Books

1. **DurgadasBasu – Introduction to the Constitution of India**
2. **Sharma, Sharma B. K. – Introduction to the Constitution of India**
3. **RandhirSarmaSrkar – The Constitution of India**
4. **Govt. of India – The Constitution of India**

III 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	18A3205401	Operating Systems	2	1	0	3	40	60	100	3
2	18A3205402	Design and Analysis of Algorithms	3	0	0	3	40	60	100	3
3	18A3205403	Compiler Design	3	0	0	3	40	60	100	3
4	PE-2	**Professional Elective -2**	3	0	0	3	40	60	100	3
5	PE-3	**Professional Elective -3**	3	0	0	3	40	60	100	3
6	18A3205404	Artificial Intelligence	3	0	0	3	40	60	100	3
7	18A3205491	Operating Systems & Unix programming Lab	0	0	2	2	40	60	100	1
8	18A3205492	R Programming lab	0	0	2	2	40	60	100	1
9	18A3205991	Aptitude and Reasoning – 2	0	0	2	2	40	60*	100	1
10	18A3205791	Hackathon	0	0	2	2	40	60*	100	1
11	18A3200791	Biology for Engineers/ Enterprising and Startup/ NSS / YOGA / Social service/ sports /games	0	2	0	2	40	60*	100	0
Total			**17**	**3**	**8**	**28**	**440**	**660**	**1100**	**22**

Code	Professional Elective -2	Code	Professional Elective -3
18A3205511	2.1 Advanced Database Management Systems	18A3205521	3.1 Computer Vision
18A3205512	2.2 UML & Design Patterns	18A3205522	3.2 Data Analytics
18A3205513	2.3 Distributed Systems	18A3205523	3.3 Software Testing Methodologies
18A3205514	2.4 Adhoc and Sensor Networks	18A3205524	3.4 Cloud Computing and Application Development

* No External Evaluation

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NRI Institute of
POTHAVARAPP
Agiripalli (M), Krishna dist

III – II Courses

OPERATING SYSTEMS

Lecture – Tutorial- Practical::	2-1-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Basics of Computer Organization.

Course Objectives:-Students will study and apply concepts related operating systems such as processand memory management, concurrency control, scheduling, I/O and files and mass storage system.

Course Outcomes:

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

CO1 Describe the important computer system resources and the structure and functioning of operating system, their process management policies and scheduling of processes by CPU.

CO2 Evaluate the requirement for process synchronization and coordination handled by operating system. Describe and analyze the memory management and its allocation policies.

CO3 Understand demand paging, thrashing and principles of deadlocks.

CO4 UnderstandFile system Interface, File System implementation, Mass-storage structure and disk scheduling algorithms.

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	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-

UNIT I :

Computer System and Operating System Overview: Overview of computer operating systems, operating systems functions, operating systems structures and systems calls, operating systems generation, **Process Management** – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT II:

Concurrency: Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples. **Memory Management**: Swapping, contiguous memory allocation, paging, structure of the page table , segmentation.

UNIT III:

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 form deadlock.

UNIT IV:

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-storage structure: overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems – Internal and Design Principles, William Stallings, Sixth Edition–2005, Pearson Education.

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.

E-RESOURCES:

https://nptel.ac.in/courses/106105214/
https://www.udacity.com/course/introduction-to-operating-systems--ud923
https://www.youtube.com/watch?v=qf668RboXLs
https://www.youtube.com/watch?v=VoaNyf9iO4Q&list=PLV8vIYTIdSnaHTjrBXjSyNTOWEtA33hvn

Course Code-Design and Analysis of Algorithms

Lecture – Tutorial- Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Data Structures
Design and Analysis of Algorithms

Course Objectives: Student will be able to

- Analyze the asymptotic performance of algorithms and components
- To study divide and conquer paradigm approach used to analyze and design algorithms
- To study greedy method approach used to analyze and design algorithms.
- To study Dynamic programming paradigm Backtracking approach used to analyze and design algorithms
- To study Backtracking approach used to analyze and design algorithms
- To study branch and bound paradigm and Deterministic approach used to analyze and design algorithms

Course Outcomes:

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

CO1	Analyze worst-case running times of algorithms using asymptotic analysis and components
CO2	Describe the divide and conquer method explains when an algorithmic design situation demands it.
CO3	Describe the greedy method explains when an algorithmic design situation demands it.
CO4	Describe the dynamic-programming paradigm explains when an algorithmic design demands it.
CO5	Describe the back tracking method explains when an algorithmic design demands it.
CO6	Describe the branch and bound paradigm and deterministic methods e-plain when an algorithmic design demands it.

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	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO6	3	3	3	2	-	-	-	-	-	-	-	-

UNIT I :

Introduction to Algorithms

Fundamentals of algorithmic problem solving – Analysis framework - Performance Analysis: - Space complexity, Time complexity - Growth of Functions: Asymptotic Notation- Big oh notation, Omega notation, Theta notation, little oh,

Divide and Conquer: Divide and conquer: General method, applications-Binary search, Quick sort,

Merge sort, Finding the Maximum and Minimum

UNIT II:

Probabilistic analysis, Amortized analysis **Greedy method:**The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, Optimal Merge Patterns, Single Source Shortest Paths

UNIT III:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT IV:

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Branch and Bound: General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution

P and NP problems, NP-Complete problems

TEXT BOOKS:

Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekaran, University press

REFERENCE BOOKS:

1. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017.
2. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education
3. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
4. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education.

E-RESOURCES:

Lecture Videos from University of Florida: https://www.cise.ufl.edu/class/cot5405sp18/index

Lecture Videos from NPTEL: https://nptel.ac.in/courses/106106131/

Course Code- COMPILER DESIGN

Lecture – Tutorial- Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Prerequisites: Formal Language and Automata Theory

Compiler Design

Course Objectives:

1. To describe the design of a compiler including its phases and components and basic understanding of Grammars and language definition.
2. To Identify the similarities and differences among various parsing techniques and grammar transformation Techniques.
3. To Understand the syntax analysis, intermediate code generation, type checking, the role of symbol table and its organization.
4. To Understand, design code generation and optimization schemes.

Course Outcomes:

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

CO1	Describe the major concept and areas of language translation in compilers, the functionality and complexity levels of various translators, linkers, loaders.
CO2	Describe practical experience in phases of compiler.
CO3	Compare and differentiate various parsing and grammar transformation techniques
CO4	Construct intermediate code and performs type checking.
CO5	Schedule symbol table and its organization.
CO6	Illustrate Code generation, obtains machine independent code optimization and instruction scheduling.

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	3	2	-	2	-	-	-	-	-	-	-
CO3	-	-	3	3	-	-	-	-	-	-	-	-
CO4	-	-	3	2	-	-	-	-	-	-	-	-
CO5	-	-	3	3	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	3

UNIT I :

Overview of Compilation: Overview of language processing – pre-processors – compiler – assembler – interpreters, pre-processors, – linkers &loaders - structure of a compiler – phases of a compiler

Lexical Analysis – Role of Lexical Analysis– Lexical Analysis Vs. Parsing – Token, patterns and Lexemes – Lexical Errors, Recognitions of tokens the lexical analyzer generator lexical

UNIT II:

Top down Parsing: Context free grammars, Top down parsing – Backtracking, First and Follow-LL(1) Grammars, Non-Recursive predictive parsing – Error recovery in predictive parsing.

What is bottom up parsing approach: Introduction to simple LR – Why LR Parsers – Model of an LR Parsers– Difference between LR and LL Parsers,Construction of SLR Tables.

More powerful LR parses, construction of CLR (1), LALR Parsing tables, Dangling ELSE Ambiguity, Error recoveryin LR Parsing. Comparison of all bottoms up approaches with all top down approaches

UNIT III:

Semantic analysis: Semantic analysis, SDT Schemes, evaluation of semantic rules. Intermediate code, three address code, quadruples, triples, abstract syntax trees. Types and declarations, type Checking.

Symbol Tables: Runtime Environments, Stack allocation of space, access to Non Local date on the stack Heap

Management code generation – Issues in design of code generation the target Language Address in the target code Basic blocks and Flow graphs. A Simple Code generation.

UNIT IV:

Machine independent code optimization – semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization. Instruction scheduling, inter procedural optimization.

Code generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

TEXT BOOKS:

1. Alfred V. Aho, Ravi Sethi& Jeffrey. D. Ullman, "Compilers Principles, Techniques & Tool. Pearson
Education, third edition, 2007.
2. Andrew N. Appel, "Modern Compiler Implementation in C", Cambridge University Press, 2004.

REFERENCE BOOKS:

1. John R. Levine, Tony Mason, Doug Brown, "lex&yacc", O'Reilly Media, Inc., 1992.
2. Kenneth C. Louden, Compiler Construction: Principles and Practice, Course Technology Inc; International
edition, 1997

E-RESOURCES:

1. https://www.holub.com/software/compiler.design.in.c.html

ARTIFICIAL INTELLIGENCE

Lecture – Tutorial-Practical::	3-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60
Prerequisites:			

Course Objectives:

1 To learn the difference between optimal reasoning vs human like reasoning
2 To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
3 To learn different knowledge representation techniques
4 To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:

Upon Completion of the course, the students will be able to

CO1 Possess the ability to formulate an efficient problem space for a problem expressed in English.
CO 2 Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
CO3 Possess the skill for representing knowledge using the appropriate technique
CO4 Possess the ability to 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

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

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	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-
CO4	3	2	-	2	-	-	-		-	-	-	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-
CO6	3	-	-	2	2	-	-	-	-	2	2	2

Unit - I

Introduction, History, Intelligent Systems, Foundations of AI, Sub areas of AI, Applications. 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

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. Representing Knowledge Using Rules: Logic

programming, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning, Matching, Control Knowledge

Unit – III

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames, Conceptual dependencies, Scripts

Unit IV

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems;
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 Mcgraw-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., AnandHareendran S.

Operating Systems &Unix programming Lab

Lecture – Tutorial-Practical::	0-0-2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60

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 theLinux 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

R-PROGRAMMING LAB

Lecture – Tutorial- Practical:: 0-0-2 **Internal Marks:** 40

Credits: 1 **External Marks:** 60

Prerequisites:

C- Programming, Data Structures, Statistics fundamentals.

Course Objectives:

1. Use R for statistical programming, computation, graphics, and modeling,
2. Write functions and use R in an efficient way,
3. Fit some basic types of statistical models
4. Use R in their own research,
5. Be able to expand their knowledge of R on their own.
6. Use Regression models in the visualization of Data Analytics.

Course Outcomes:

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

CO1	List motivation for learning a programming language.
CO2	Access online resources for R and import new function packages into the R workspace.
CO3	Import, review, manipulate and summarize data-sets in R
CO4	Explore data-sets to create testable hypotheses and identify appropriate statistical tests
CO5	Perform appropriate statistical tests using R Create and edit visualizations
CO6	Ability to analyze different Data Analytics 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

1. Implementation of Data Frames and Lists.
2. Implementation of Matrix Addition and Multiplication.
3. Implementation of Quick Sort.
4. Implementation of Binary Search Tree.
5. Implementation of Set Operations.
6. Implementation of Reading and Writing files.
7. Implementation of Graph Operations.
8. Implementation of Correlation.
9. Implementation of ANNOVA.
10. Implementation of Linear Regression.
11. Implementation of Logistic Regression.
12. Implementation of Random Forest.

TEXT BOOKS:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. R for Everyone, Lander, Pearson

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,RobKabacoff, Manning

E-RESOURCES:

1. https://nptel.ac.in
2. https://www.coursera.org/learn/r-programming
3. https://www.r-project.org/

Course Code- Aptitude and Reasoning 2

Lecture – Tutorial-Practical::	0-0-2	**Internal Marks:**	40
Credits:	1	**External Marks:**	60*
Prerequisites:			

Course Objectives:

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 the course, the student will be able to:

CO1	Solve the Arithmetic and Reasoning Problems as fast as possible and as simple as possible.
CO2	Exhibits good analytical skills and aptitude skills.
CO3	Perform well in all competitive exams like RRB, SSC, GROUPS, and BANKING
CO4	Clear the aptitude section of exams for higher education like CAT, GMAT, and GRE 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	-	3	-	2	-	-	-	-	2	-	3
CO2	2	-		-	-	-	-	2	-	-	2	2
CO3	3	-	2	-	-	-	-	-	-	-	-	2
CO4	3	-	2	2	-	-	-	-	-	-	-	3

UNIT I :

1. NUMBER SYSTEM
2. PROBLEMS ON HCF & LCM

UNIT II:

1. DATA SUFFICIENCY
2. ODD ONE OUT

UNIT III:

1. VENN DIAGRAMS
2. ANALOGY

UNIT IV:

1. RATIOS & PROPORTIONS

TEXT BOOKS:

1) **APTIPEDIA, WILEY**
2) **Quantitative Aptitude, RS AGARWAL, S.Chand Publishers**

REFERENCE BOOKS:

HOW TO PREPARE FOR Quantitative Aptitude, ARUN SHARMA, Mc GRAW HILL

E-RESOURCES:

1. **M4maths**
2. **Crack Aptitude**
3. **Faceprep**

COURSE CODE-HACKATHON

Lecture -Tutorial- Practical::	0-0-2*	Internal marks:	40
Credits:	1	External marks:	60*

Prerequisites: Data Structures, Any Programming Language (C/C++/JAVA/PYTHON), Competitive Coding

Course Objectives:

1 To build funnel for designing solutions.
2 To harness creativity and expertise of students
3 To spark institute-level hackathons

Course Outcomes:

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

CO1 Familiar with various problems and their solutions.
CO2 Design innovative solutions for daunting problems
CO3 Crowd source solutions for real time problems
CO4 Improve their analytic and problem solving skills

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
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3

Course outline:

Hackathon is an initiative to provide students a platform to solve some of the pressing problems and thus inculcate a culture of product innovation and a mindset of problem solving.

The students have the opportunity to work on challenges faced within various situations to create solid solutions. This course is to inculcate students in acquiring employability skills.

The focus of the course is the development and implementation of algorithms, as well as the skills required for programming competitions. The students will learn to select appropriate algorithms for a given problem, integrate multiple algorithms for solving a complex problem, design new algorithms and implement them in any program language of their choice like C/C++/JAVA/PYTHON. They will also learn skills required for participation in programming contests, which include evaluation of problem difficulty, solving problems in teams, and work under time pressure.

Students are expected to complete coding of allotted task by the instructor. The task is allotted to students on the spot. The task is evaluated through online hackathon environments like Hackerrank, Hackerearth, Instacks, etc. The task contains a clear description of the problem including the perquisites, conditions and range of data, etc. The problem description also displays sample test cases and respective outputs. The successful outputs of all sample and hidden test cases in stipulated time is considered as successful completion of Hackathon for the student.

Student need to submit a copy of the Question along with criteria provided, flowchart of their proposed solution, their actual solution and outcomes obtained. These stand a basis for the evaluation.

Such Hackathons are conducted for four sessions.

1. Hackathon based on numericals, patterns, etc.
2. Hackathon based on Strings, files, etc.
3. Hackathon based on web page design for a given problem

4. Hackathon based on database connectivity.

For a single session of Hackathon, the following evaluation process to be followed

The Flowchart of proposed solution for Hackathon is awarded 5 Marks.

The actual successful solution is proportionately awarded a maximum of 10 Marks. .

The obtained marks proportionately awarded a maximum of 10 Marks.

Text books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, And Clifford Stein, Introduction To Algorithms, First Or Second Edition, Mcgraw Hill.
2. Data Structures And Algorithmic Thinking With Python, By NarasimhaKarumanchi, Careermonk Publications
3. Dynamic Programming For Coding Interviews. A Bottom-Up Approach To Problem Solving, By Meenakshi& Kamal Rawat, Notion Press

Reference Books:

1. Cracking The Coding Interview 6th Edition
2. Guide To Competitive Programming: Learning And Improving Algorithms Through Conte (Undergraduate Topics In Computer Science) Springer

E-resources:
Hackerrank.com
Hackerearth.com
Instacks.com

Course Code-BIOLOGY FOR ENGINEERS

Type of Course : Audit course

Lecture – Tutorial-Practical::	0-2-0 (Audit Course)	**Internal Marks:**	40
Credits:	0	**External Marks:**	60*
Prerequisites:			
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Course Objectives: The objective of this course is to provide basic knowledge in biology for the engineers and to analyze biological process in computational tools.

Course Outcomes:

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

CO1	Describe the fundamental Principles and methods of engineering
CO2	Identify the functions of different types in bio-molecules
CO3	Describe mechanisms underlying the working of molecular biological processes including enzyme catalysis, metabolic pathways, gene expression.
CO4	Use Excel, MATLAB and other computational tools to quantitatively analyze biological processes.
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	-	3	-	2	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	3	-	-	-	-	-	-	-	-
CO4	-	1	-	2	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

UNIT I :

UNIT I:**Introduction and Classification of Living organisms. Introduction:** Fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Biology as an independent scientific discipline. Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.**Classification:**Classification of living organisms based on (a) Cellularity-Unicellular or multicellular (b) Ultrastructure-prokaryotes or eukaryotes. (c) Energy and Carbon utilization - Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion –aminotelic, uricotelic, ureotelic (e) Habitat-acquatic, terrestrial (e) Molecular taxonomy-three major kingdoms of life.

UNIT II:

Biomolecules and EnzymesBiomolecules:Biomolecules: Structures of sugars(Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins-structure and functions-as enzymes, transporters, receptors and structural elements**Enzymes:** Enzyme

classification, Mechanism of enzyme action.Enzymekinetics and kinetic parameters.

UNIT III:

"Genetics is to biology what Newton's laws are to Physical Sciences" Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Concepts of recessiveness and dominance. Gene interaction, Epistasis. Meiosis and Mitosis be taught asa part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring.InformationTransfer:DNA as a genetic material. Hierarchy of DNA structure-from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

UNIT IV:

Metabolism :Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. Breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions.Microbiology:Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.

TEXT BOOKS:

Reference Books:

[1] Biology:A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

[2] Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

REFERENCE BOOKS:

[1] Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

[2] Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

E-RESOURCES:

[1].https://bee.cals.cornell.edu/sites/bee.cals.cornell.edu/files/shared/documents/Career_BEE_Final-for-eb.pdf

[2].https://www.teachengineering.org/subjectareas

Course Code- Enterprising and Startup skills
Type of Course :Audit Course

Lecture – Tutorial- Practical:: 0-2-0 **Internal Marks:** 40

Credits: 0 **External Marks:** 60*

Prerequisites: Creativity, Logical reasoning

Enterprising and Startup skills

Course Objective:

The enable the students develop and systematically apply an entrepreneurial way of thinking that will allow them to identify and create business opportunities that may be commercialized successfully

Course Outcomes:

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

CO1	To evaluate the role and importance of entrepreneurship for economic development
CO2	To acquire necessary knowledge and skills required for organising and carrying out entrepreneur activities through training.
CO3	To analyse and apply contemporary project management tools and methodologies
CO4	To learn policies and their support to small and micro enterprises.
CO5	To consider the legal and financial conditions for starting a business venture, evaluate the effectiveness of different entrepreneurial strategies and challenges
CO6	To understand about supportive role of government, financial institutions and educational institutions offering ED Programmes

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	-	2	-	-	-
CO2	3	-	2	-	2	-	-	-	2	-	-	-
CO3	2	2			2	-	-	-	-	-	3	-
CO4	2	-	-	-	-	2	2		-	-	-	2
CO5	2	-	-	-	-	2	2	2	-	-	-	2
CO6	2	-	-	-	-	2	2	2	-	-	-	2

UNIT I :

Entrepreneurship and Training : Importance and growth of **Entrepreneurship** , Characteristics and Qualities of Entrepreneur, Designing Appropriate Training Programmes to inculcate Entrepreneurial Spirit, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning.

UNIT II:

Planning and Evaluation of Projects: Growth of the Firm, Project identification and selection, Factors inducing growth , Project Feasibility Study , Post Planning of Project, Project Planning and Control.

UNIT III:

Small and Micro Enterprises: Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies.

UNIT IV:

Institutional Support to Entrepreneur and MSMEs: Role of Government - Role of IDBI, NIESBUD, SISI, DIC, Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programmes

TEXT BOOKS:

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi,2012.
2. VSP Rao, Kuratko: "Entrepreneurship', Cengage Learning, NewDelhi,
3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012
4. B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011

REFERENCE BOOKS:

1. Rajeev Roy: "Entrepreneurship", Oxford University Press, NewDelhi,2012
2. P.C.Shejwalkar: "Entrepreneurship Development", Everest Publishing House, NewDelhi, 2011

E-RESOURCES:

1. http://ediindia.ac.in/e-policy/ [Entepreneurial Policy India]
2. http://en.wikipedia.org/wiki/List_of_venture_capital_companies_in_India [Venture Capital]
3. indiavca.org/venture-capital-in-india.html [Venture Capital]

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
Credits: 3
Prerequisites: Image processing
Internal Marks: 40
External Marks: 60

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:			

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	**Internal Marks:**	40
Credits:	3	**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: 9. 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

NRIA18 : ACADEMI CURRICULUM FOR B.TECH (INFORMATION TECHNOLOGY)

III 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	18A3105401	Advanced Data Structures	2	1	0	3	40	60	100	3
2	18A3105402	Computer Networks	2	1	0	3	40	60	100	3
3	18A3105403	Formal Languages and Automata Theory	3	0	0	3	40	60	100	3
4	PE-I	**Professional Elective-1**	3	0	0	3	40	60	100	3
5	OE-II	**Open Elective-II**	3	0	0	3	40	60	100	3
6	18A3105492	Computer Networks lab	0	1	2	3	40	60	100	1.5
7	18A3105491	Advanced Data Structures Lab	0	0	3	2	40	60	100	1.5
8	18A3101301	Basics of Civil and Mechanical Engineering / Swayam/NPTEL **	0	2	0	2	40	60*	100	1
9	18A3105791	Competitive Coding	0	0	2	2	40	60*	100	1
10	18A3105792	Seminar	0	0	2	2	40	60*	100	1
11	18A3100801	Indian Constitution	0	1	2	2	40	60*	100	0
Total			**13**	**6**	**11**	**28**	**440**	**660**	**1100**	**21**

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

* No External Evaluation

Head, IT Department
NRI Institute of Technology
POTHAVARAPPADU (V)
Agiripalli (M), 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

STRUCTURE FOR FIRST YEAR B.TECH PROGRAMME

I YEAR I SEMESTER

S.NO.	COURSE CODE	TITLE OF THE COURSE	SCHEME OF INSTRUCTIION				SCHEME OF EXAMINATION			NO. OF CREDITS
			L	T	P/D	Total	CIA	SEA	Total	
1	20A1100101	Professional Communication	2	0	2	4	30	70	100	3
2	20A1100201	Engineering Mathematics-1	3	0	0	3	30	70	100	3
	20A1100204	Applied Chemistry	3	0	0	3	30	70	100	3
4	20A1105392	Computer Engineering Workshop	1	0	4	5	15	35	50	3
5	20A1105301	Programming and Problem Solving With C	3	0	0	3	30	70	100	3
6	20A1100293	Applied Chemistry LAB	0	0	3	3	15	35	50	1.5
7	20A1105391	Programming and Problem Solving With C Lab	0	0	4	4	15	35	50	2
8	20A1100801	Environmental Sciences	2	0	0	2	30	70*	100	0
TOTAL			14	0	13	27	195	455	650	18.5

I YEAR II SEMESTER

S.NO.	COURSE CODE	TITLE OF THE COURSE	SCHEME OF INSTRUCTIION				SCHEME OF EXAMINATION			NO. OF CREDITS
			L	T	P/D	Total	CIA	SEA	Total	
	20A1200201	Engineering Mathematics-2	3	0	0	3	30	70	100	3
2	20A1200203	Applied Physics	3	0	0	3	30	70	100	3
3	20A1204302	Digital Logic Design	2	0	2	4	30	70	100	3
4	20A1205401	Oops Through Java	3	0	0	3	30	70	100	3
5	20A1205303	Data Structures	3	0	0	3	30	70	100	3
6	20A1200292	Applied Physics Lab	0	0	3	3	15	35	50	1.5
7	20A1205491	Oops Through Java Lab	0	0	4	4	15	35	50	2
8	20A1205393	Data Structures Lab	0	0	3	3	15	35	50	1.5
9	20A1200191	Communicative English Lab	0	0	3	3	15	35	50	1.5
TOTAL			14	0	15	29	210	490	700	21.5

* No external Evaluation

Head, IT Department
NRI Institute of Technology
POTHAVARAPPADU (V)
Agiripalli (M), Krishna Dist.

20A1105392: Computer Engineering Workshop
(Common to CSE, IT, AIML and DS)

Lecture – Tutorial- Practical:	2-0-4	**Internal Marks:**	15
Credits:	3	**External Marks:**	35

Prerequisites:

Course Objectives:

The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

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

CO1	Identify the basic computer peripherals
CO2	Acquire sufficient knowledge on assembling and disassembling a PC
CO3	Learn the installation procedure of Windows and Linux OS
CO4	Acquire knowledge on basic networking infrastructure, internet and World Wide Web
CO5	Learn productivity tools like Word, Excel and Power point

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 9	PO 10	PO 11
CO1	1									
CO2	2	3								
CO3			2					3		
CO4			2					2		
CO5			2							

List of Experiments

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 3: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 4: Linux Operating System commands:

- General command syntax
- Basic help commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 5: Networking Commands:

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget,route

Experiment 6: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins
- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

Productivity Tools:

Experiment 7: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 8:

Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Experiment 9: Automation of an activity using AI tools

Text Books:

1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.do

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

20A1100293: Applied Chemistry Lab

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

Prerequisites: Knowledge on Volumetric analysis.

Course Objectives:

- To provide knowledge of chemistry practicals.
- It enables the students to analyze the different parameters of water sample like hardness and alkalinity and different volumetric titrations.
- It makes the students to obtain basic knowledge of instrumentation based on different Engineering applications.

Course Outcomes:

CO1	Students of Engineering should understand and apply polymers and plastic technologies along with their utilization to solve the problems of the society.
CO2	Knowledge of cells and sensors utilized in many instruments is necessary to engineering students in solving and applying to batteries and fuel cells.
CO3	Knowledge of electrochemical cells is essential in understanding corrosion along with the methods of controlling to budding engineers.
CO4	Students should have the knowledge of water and its hardness, boiler troubles and problems associated with the environment and its sustainability.
CO5	Knowledge of fuels and energy, their advantages & disadvantages should be known by the students to solve and understand engineering problems.
CO6	Knowledge, design and analysis of materials should be understood by the Engineering students in solving the complex problems of the society.

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								
CO2	3	3	1	-								
CO3	3	2	2	-								
CO4	3	1	-	1								
CO5	3	2	2	1								
CO6	3	1	1	1								

List of Experiments

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Determination of HCl using standard Na_2CO_3 solution.
3. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
4. Determination of $KMnO_4$ using standard Oxalic acid solution.
5. Determination of total hardness of water using standard EDTA solution.
6. Determination of Iron using standard $K_2Cr_2O_7$ solution
7. Estimation of vitamin C
8. Determination of Iron by a Colorimetric method using thiocyanates as reagent.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Preparation of Bakelite.
12. Determination of pH of water sample

Propagation of electromagnetic wave through optical fibers - Applications.

Unit-III: Magnetic and Dielectric Materials **(10hrs)**

Magnetic Materials: Introduction - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius- Mossotti equation.

Unit IV: Quantum Mechanics, Free Electron Theory **(8hrs)**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Fermi energy-Density of states.

Unit - V: Band theory of Solids &Semiconductors **(10hrs)**

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids-Concept of hole.

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient – Applications of Hall effect.

TEXT BOOKS:

1. **M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy**" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics by **P.K.Palanisamy** SciTech publications

REFERENCE BOOKS:

1. Engineering Physics by **M.R.Srinivasan**, New Age international publishers (2009).
2. Engineering Physics - **Sanjay D. Jain, D. Sahasrabudhe and Girish**, University Press
3. **B.K. Pandey and S. Chaturvedi**, Engineering Physics, Cengage Learning

E-RESOURCES: www.doitpoms.ac.uk, http://www.itp.uni-hannover.de/~zawischa/ITP/diffraction.html, http://www.coherent.com/products/?834/Lasers, **http://plato.stanford.edu/entries/qm/**

20A1205303: Data Structures
(Common to CSE,IT,AIML,DS)

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

Prerequisites: C- Programming

1. To impart basic knowledge of data structures.
2. Be familiar with basic techniques of algorithm analysis
3. Be familiar with writing recursive methods
4. To understand concepts about searching and sorting techniques
5. To design and implementation of various basic and advanced data structures like stacks, queues, lists, trees and graphs.
6. To introduce various techniques for representation of the data in the real world.

Course Outcomes:

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

CO1	Ability to illustrate the concepts of algorithm apply the learning concepts to design data structure for the given problem definition.
CO2	Analyze and implement operations on linked list and demonstrate their applications
CO3	Ability to design applications using stacks and queues and implements various types of Queues
CO4	Ability to analyze and implement operations on trees
CO5	Ability to demonstrate various operations on binary search trees and its applications
	Ability to evaluate the properties and operations on graphs and implement the graph 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	--	--	--	2	--	--	--	--	--	--	2
CO2	--	2	2	2	--	--	--	--	--	--	2	2
CO3	2	2	3	--	2	--	--	--	--	--	--	--
CO4	--	2	3	2	--	--	--	--	--	--	2	2
CO5	3	2	3	3	2	--	--	--	--	--	2	2

UNIT I :

Data Structures - Definition, Classification of Data Structures, Operations on Dat Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Spac complexity. Searching - Linear search, Binary search, Fibonacci search. Sorting- Insertio sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), mergin (Merge sort) algorithms.

UNIT II:

Linked List: Introduction, Single linked list, Representation of Linked list in memory Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversin Single Linked list, Applications on Single Linked list- Polynomial Expressio Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertio Deletion, Circular Linked list-Insertion, Deletion.

UNIT III:

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linke list, Implementation of Queues-using Arrays and using Linked list, Application of Queue Circular Queues, Deques, Priority Queues, Multiple Queues. Stacks: Introduction t Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representatio of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation Infix to Postfix Conversion, Evaluating Postfix Expressions..

UNIT IV:

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Tree using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balance Binary Trees- AVL Trees, Insertion, Deletion and Rotations.

UNIT V:

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm

TEXT BOOKS:

1) Data Structures Using C. 2nd Edition.Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss

REFERENCE BOOKS:

1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

E-RESOURCES:

1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

20A1205401: OOPS THROUGH JAVA
(Common to CSE,IT,AIML,DS)

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

Prerequisites:

C Programming

Course Objectives:

To **introduce** the object oriented programming concepts.
To **understand** object oriented programming concepts, and apply them in solving Problems.
To **introduce** the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
To **introduce** the implementation of packages and interfaces
To **introduce** the concepts of exception handling and multithreading.
To **introduce** the design of Graphical User Interface using applets.

Course Outcomes:

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

CO1	Understand the concepts of object oriented programming
CO2	Able to **understand** the use of abstract classes and Packages in java.
CO3	Implement Exception Handling techniques and multiple inheritance through interfaces
CO4	Able to understand multithreaded applications with synchronization
CO5	Develop Graphical user interface applications using Swing and Applet Components

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
CO2	3	3	3	-	-	-	-	-	-	-	-	3
CO3	3	3	3	2	-	-	-	-	2	-	-	3
CO4	3	3	3	2	-	-	-	-	2	-	-	3

UNIT I

GENESIS OF JAVA: History of Java, Importance of java to Internet, Byte code, Java Features, Data types, variables, scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program.
CLASSES AND OBJECTS: classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, Exploring the String class, String Buffer Class, String Tokenizer.

UNIT II

INHERITANCE: Inheritance basics, Using super keyword, method overriding, Dynamic method dispatch using final with inheritance, abstract classes.
PACKAGES AND INTERFACES: Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces..

UNIT III

EXCEPTION HANDLING AND MULTITHREADING: Exception handling Fundamentals, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exceptions. Differences between multi threading and multitasking, thread life cycle, creating threads, Concurrency utilities. APPLETS: Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets.

13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect 14. Determination of wavelength of Laser light using diffraction grating. **15.** Rigidity modulus of material of a wire-dynamic method (Torsional pendulum). **Note: Any 8 experiments out of 15 should be done in the laboratory and 2 experiments in virtual lab.**
TEXT BOOKS:
S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
REFERENCE BOOKS:
Engineering Physics / Applied Physics Lab Manual – **Spectrum Publications**
E-RESOURCES: www.vlab.co.in

Data Structures Lab
(20A1205393)

Lecture – Tutorial- Practical:	0-0-3	Internal Marks:	15
Credits:	1.5	External Marks:	35

Prerequisites:

C Programming

Course Objectives:

- To understand and implement basic data structures
- To Apply linear and non linear data structures in problem solving.
- Have a good understanding of how several fundamental algorithms work, particularly those concerned with sorting and searching.
- Have a good understanding of the fundamental data structures used in computer science
- It enables them to gain knowledge in practical applications of data structures.

Course Outcomes:

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

CO1	Implement different searching and sorting techniques. Compare different searching and sorting techniques.
CO2	Design linear data structures stacks, queues and linked lists.
CO3	Design nonlinear data structures trees and Graphs, and implement their operations
CO4	Be capable to identity the appropriate data structure for given problem
CO5	Have practical knowledge on the applications of data structures

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 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	-	-	-	-	-	-	2
CO2	3	2	3	2	-	-	-	-	-	-	2
CO3	3	2	3	2	-	-	-	-	-	-	2
CO4	3	2	3	2	-	-	-	-	-	-	2
CO5	3	2	3	2	-	-	-	-	-	-	2

List of Experiments

Exercise 1:

a. Write a recursive C program to find the Factorial of an integer.
b. Write a recursive C program to calculate the GCD of two numbers.
c. Write a recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.
d. Write a recursive C program to display the Fibonacci Series: 0, 1, 1, 2, 3, 5, 8, ...N.

Exercise 2:

a. Write a recursive and non-recursive C program to implement Linear Search technique.
b. Write a recursive and non-recursive C program to implement Binary Search

technique.

Exercise 3:

a. Write C program that implement Insertion sort, to sort elements in an ascending order.

b. Write C program that implement Merge sort, to sort elements in an ascending order.

c. Write C program that implement Quick sort, to sort elements in an ascending order.

Exercise 4:

a. Write a C program to insert a node in a Single Linked List.

b. Write a C program to delete a node in a Single Linked List.

c. Write a C program to reverse elements in a Single Linked List.

d. Write a C program to insert a node in a Doubly Linked List.

Exercise 5:

a. Write C program that implement Stack (its operations) using arrays.

b. Write C program that implement Queue (its operations) using arrays.

c. Write C program that implement Queue using Two Stacks.

Exercise 6:

a. Write C program that implement Stack using Linked List.

b. Write C program that implement Queue using Linked List.

c. Write a C program to implement the Circular Queue.

Exercise 7:

a. Write a C program to insert elements in a Binary Search Tree (BST).

b. Write a C program to delete element in a Binary Search Tree (BST).

c. Write a C program to implement BST traversals: Inorder, Preorder, and Postorder.

Exercise 8:

a. Write a C program to implement the Max Heap.

b. Write C program that implement Heap sort, to sort elements in an ascending order.

Exercise 9:

a. Write a C program to implement the Breadth First Search technique on a Graph.

b. Write a C program to implement the Depth First Search technique on a Graph.

Exercise 10:

a. Write a C program to implement the Prim's algorithm to construct Minimum Spanning Tree.

b. Write a C program to implement the Kruskal's algorithm to construct Minimum Spanning Tree.

TEXT BOOKS:

1 Data Structures using C,Reema Thareja, Oxford

2.DATA STRUCTURE USING C,Udit Agarwal,KATSON Books

3 Data Structures using C, 2nd Edition, by A. K. Sharma, Pearson India

REFERENCE BOOKS:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.

2. Richard Johnsonburg, Discrete mathematics, 7/e, Pearson Education, 2008

OOPS Through JAVA Lab
(20A1205491)

Lecture – Tutorial- Practical:	0-0-4	Internal Marks:	15
Credits:	2	External Marks:	35

Prerequisites:

C Programming

Course Objectives:

To develop programs using object oriented concepts.
To develop GUI applications and Client/Server communication using Java.

Course Outcomes:

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

CO1	Understand the concepts of object oriented programming.
CO2	Implement Exception Handling techniques and multiple inheritance through interfaces.
CO3	Apply thread capabilities and Collections framework.
CO4	Develop Graphical user interface applications using Swing and Applet Components.

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	3	--	2	--	--	--	--	--	--	--	--
CO3	--	--	2	--	2	--	--	--	3	--	--	2
CO4	--	--	2	2	--	--	--	--	2	--	--	3

List of Experiments

Exercise 1

a) Write a Java program that prints all real solutions to the quadratic equation ax2 + bx +c 0. Read in a, b, c and use the quadratic formula. If the discriminant b2 -4ac is negative, display a message stating that there are no real solutions.

b) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and1.Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

Exercise 2

a) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.

b) Write a Java program to multiply two given matrices and find it's transpose (Exercise Find identity Matrix of a given size)

Exercise3

a) Write a Java program that checks whether a given string is a palindrome or not. Ex MALAYALAM is a palindrome.

b) Write a Java program for sorting a given list of names in ascending order.

c) Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)

Exercise 4

a) Write a Java program that reads a file name from the user, and then displays information

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DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION

II MBA III SEMESTER

Subject	Title	Contact Hrs		Marks			Credits
		L+T	P	I	E	T	
18E2198401	Strategic Management	4		40	60	100	3
18E2198402	Legal Aspects of Business	4		40	60	100	3
18E2198403	Business Ethics & Corporate Governance	4		40	60	100	3
HR							
18E2198511	Leadership Management	4		40	60	100	3
18E2198512	Compensation and Reward Management	4		40	60	100	3
18E2198513	Performance Management	4		40	60	100	3
18E2198514	Strategic Human Resource Management	4		40	60	100	3
FINANCE							
18E2198521	Security Analysis & Portfolio Management	4		40	60	100	3
18E2198522	Banking and Insurance Management	4		40	60	100	3
18E2198523	Advance Management Accounting	4		40	60	100	3
18E2198524	Strategic Financial Management	4		40	60	100	3
MARKETING							
18E2198531	Consumer Behavior	4		40	60	100	3
18E2198532	Retail Management	4		40	60	100	3
18E2198533	Customer Relationship Management	4		40	60	100	3
18E2198534	Strategic Marketing Management	4		40	60	100	3
SYSTEMS							
18E2198541	E-Business	4		40	60	100	3
18E2198542	RDBMS	4		40	60	100	3
18E2198543	Web Designing	4		40	60	100	3
18E2198544	System Analysis & Design	4		40	60	100	3

Head, MBA Department
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II MBA III SEMESTER

Sub Code: 18E2198401	**Name of the Course: STRATEGIC MANAGEMENT**		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. To expose students to various perspectives and concepts in the field of strategic management.
2. To understand Strategy formulation process and frameworks, tools and techniques of strategic analysis and its application.
3. To identify the Conceptual, diagnostic and analytical and conceptual skills in strategy formulation and execution.
4. Enable the students to understand the principles of strategy implementation in the organisation.
5. To learn about strategy evaluation and control by using quality and quantity benchmarking.

Course Outcomes:

1. To understand the concepts of strategic management its nature in industry and competitive analysis.
2. Students will demonstrate a clear understanding of the concepts, tools & techniques used by executives in developing and executing strategies and will appreciate its integrative and interdisciplinary nature.
3. Conceptual, diagnostic and analytical and conceptual skills in strategy formulation and execution.
4. Students will be able to develop their capacity to think and execute strategically.
5. Execute strategic information systems, strategic surveillance and strategic audit.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2									2	1	1
CO2	1	2	2	2								2	1	1
CO3	1		2	2							2		2	2
CO4	1			3							2		2	2
CO5	1	2	2	2								2	2	2
Tot	5	6	8	9							4	6	8	8
Avg.	1	2	2	2.3							2	2	1.6	1.6

Syllabus:

UNIT 1

Introduction: Concepts in Strategic Management, Strategic Management as a process – Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Drafting a strategy - Industry and Competitive Analysis

UNIT 2

Environmental Scanning and leadership: Methods. SWOT Analysis –Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

UNIT 3

Strategy Formulation : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

UNIT 4

Strategy Implementation : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

UNIT 5

Strategy Evaluation and control – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance -strategic audit

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Vijaya Kumar P,. Hitt A: **Strategic Management**, Cengage learning, New Delhi,2010
2. John A PearceII, Amita Mital: "**Strategic Management**", TMH, New Delhi, 2012.
3. Sanjay Mohapatra: "**Cases Studies in Strategic Management**", Pearson, New Delhi,2012
4. Adrian Haberberg&Alison: **Strategic Management**, Oxford University Press, New Delhi, 2010
5. P.Subba Rao: "**Business Policy and Strategic Management**" Text and Cases, Himalaya Publishing House, New Delhi, 2011
6. .Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "**Strategic Management and Business Policy**", Excel Books, New Delhi, 2012

Sub Code: 18E2198402	**Name of the Course: LEGAL ASPECTS OF BUSINESS**		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To provide an overview of Indian Contracts Act, 1872 that has a bearing on the conduct of business in India.
2. Able to have a basic understanding of the laws relating to contract, consumer protection, competition, companies and dispute resolution.
3. To know the Negotiable Instruments Act, 1881, Contract of Agency.
4. To understand Indian Partnership Act, 1932
5. To explain the various legal forms that a business entity can take and the relative advantages and disadvantages of each of these forms.

Course Outcomes

1. Identify the fundamental legal principles behind contractual agreements.
2. To able to apply basic procedures for handling consumer disputes.
3. Acquire problem solving techniques and to be able to present coherent, concise legal argument.
4. Summarize Indian Partnership Act Dissolution of Partnership
5. To examine the various legal forms that a business entity can take and the relative advantages and disadvantages of each of these forms.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1			2		2		2				2	1	1
CO3	1	3		2		2		2		2			2	2
CO4	1												2	2
CO5	1			2		2	2			2			2	2
Tot	5	3		6		6	2	4		4		2	8	8
Avg.	1	3		2		2	2	2		2		2	1.6	1.6

Syllabus:

UNIT 1

Importance of Commercial Law: The Indian Contracts Act, 1872 – Nature of the Act and Classification of Contracts – Essentials of a Valid Contract – Offer and Acceptance – Capacity – Consideration –Free Consent –Legality of Object –Performance of a Contract – Discharge of a Contract – Breach of a Contract and Remedies.

UNIT 2

Sales of Goods Act: Distinction between Sales and Agreement to Sell – Conditions and Warranties – Performance of Contract of Sale –Transfer of Ownership – Rights of an Unpaid Seller. Consumer Protection Act, 1986: Consumer Right –Machinery for Redressal of Consumer Grievances.- Information Technology Act 2000.

UNIT 3

Contract of Agency: Kinds of Agents –Creation of Agency- Duties and Rights of Principal and Agents- Principal's Liability for the Acts of the Agent-Liability of Agent –Termination of Agency. Negotiable Instruments Act, 1881- Kinds of a Negotiable Instruments and endorsement-Presentation and discharge of Negotiable Instrument.

UNIT 4

Indian Partnership Act, 1932: Meaning and Essentials of Partnership- Registration – Tests of Partnership-Duties and Rights of Partners – Dissolution of Partnership.

UNIT 5

Company Act 1956: Nature and Types of Companies – Formation – Memorandum of Association-Articles of Association –Kinds of Shares –Duties of Directors-Winding up.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ravindra Kumar: "**Legal Aspects of Business**", Cengage Learning, New Delhi, 2011
2. Kuchhal M C, Deepa Prakash: "**Business Legislation for Management**", Vikas Publishing House, New Delhi, 2012
3. Pathak: "**Legal Aspects of Business**", Tata McGraw Hill, New Delhi, 2010
4. S.N.Maheshwari, S.K.Maheshwari: "**A Manual of Business Laws**", Himalaya Publishing House, 2013.

5 P.K.Padhi: "**Legal Aspects of Business**", PHI Learnings, New Delhi, 2013

Sub Code: 18E2198403 Name of the Course: BUSINESS ETHICS AND CORPORATE GOVERNANCE

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To understand the basic concepts of Business Ethics and Corporate Governance.
2. To enlighten the student with regard to globalization and its impact on Business Ethics and Indian Capital Markets.
3. Learn about ethics in core areas like Marketing, HRM, and Financial Management.
4. Acquaintance in respect of transparency maintained by the companies through Corporate Governance.
5. Provide knowledge regarding applicability of Corporate Governance with Indian scenario.

Course Outcomes :

1. Have an idea about Business Ethics and Law and Ethical Decision Making.
2. Know the Impact of Globalization on Indian Business Ethics and Major Indian Scams.
3. Aware of ethical issues and how it could be impacts on Marketing, HRM and Financial Issues.
4. Know the Corporate Governance and its principles and practices around the globe.
5. Aware of Corporate Governance and its implications in Indian Scenario and role of various interested parties towards company.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1	2						3				2	1	1
CO3	1	2				2		3				2	2	2
CO4	1	2		2		2	2	3		2		2	2	2
CO5	1	2				2		3		2		2	2	2
Tot	5	8		2		6	2	12		4		8	8	8
Avg.	1	2		2		2	2	3		2		2	1.6	1.6

Syllabus:

UNIT 1

Importance of Business Ethics: Values and Ethics- Business Ethics and Law – Ethics in Work Place – Ethical Decision Making- Theories of Business Ethics – Management and Ethics- Indian Ethical Traditions

UNIT 2

Impact of Globalization on Indian Business Ethics: Reasons for Unethical Practices among Indian companies – Development of Indian Capital Markets – Various studies on Ethical Attitudes of Managers Major Indian Scams

UNIT 3

Ethics in Marketing, HRM and Finance: Product safety and Pricing-Ethical responsibility in Product- Advertising and Target Marketing Ethics of sales, advertising and product placement and Consumer Autonomy. Ethics in HRM & Finance – HR related ethical issues - Institutional Culture – Frauds in Banks - Measures against Bank Frauds – Frauds in Insurance sector

UNIT 4

Corporate Governance: An overview – Theory and Practice of Governance- Indian model of Governance- Good Corporate Governance – Land marks in emergence of Governance OECB Principles – Sarbanes-Oxley Act 2002- SEBI Initiatives

UNIT 5

Corporate Governance Indian Scenario: Role of Government in Ensuring Corporate Governance – Governance issues relating to Board of Directors – Duties and responsibilities of Auditors – Governance under limited competition – Role of Media – Corporate Governance in Developing and Transiting Economies.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. S.K.Mandal: "**Ethics in Business and Corporate Governance**", TMH, New Delhi, 2012.
2. Marianne M Jennings: "**Cases in Business Ethics**", Cengage Learning, New Delhi, 2012.
3. S.Prabhakaran: "**Business Ethics and Corporate Governance**", Excel Books, New Delhi, 2011.
4. N.Balasubramanyam: "**A Case Book on Corporate Governance and Stewardship**", TMH., New Delhi, 2011.
5. A.C.Fernando: "**Business Ethics and Corporate Governance**", Pearson Publishers, New Delhi, 2013.

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HR ELECTIVE 1

Sub Code: 18E2198511 **Name of the Course: LEADERSHIP MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. Identify contemporary leadership models and their significance.
2. Provide knowledge about motivational theories like Maslow's etc.
3. Understand about leadership development and leadership attitudes.
4. Create awareness about leadership self management, assertiveness, edification teams, types of teams and team building techniques and their prominence.
5. Able to know GLOBE research program of Wharton School, challenges of leadership in varying cultures and values, corporate social responsibility.

Course Outcomes :

1. Students are able to develop the skills required for leader and able to know and handled the different situation and people
2. able to adopt varies strategies of through motivation and manage organisational culture.
3. assume the situation easily for enhancing organization through leadership development.
4. Facilitate leadership self management, assertiveness, edification building and managing teams effectively.
5. Exposed to Global perspectives of leadership, Corporate Social Responsibility across globe.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1							2		2			1	1
CO2	1			2						2		2	1	1
CO3	1	2				2	2		2	2			2	2
CO4	1	2							2			2	2	2
CO5	1	2				2	2	2	2	2		2	2	2
Tot	5	6		2		4	4	4	6	8		6	8	8
Avg.	1	2		2		2	2	2	2	2		2	1.6	1.6

Syllabus:

Unit 1:

Organisational Leadership: Definition,Components and evaluation of leadership,factors of

leadership,Situational Leadership Behaviour: Meaning, Fiedler Contingency Model, Path Goal and Normative Models - Emerging Leadership Behaviour: Transformational, Transactional and Visionary Leadership - Leadership for the new Millennium Organisations - Leadership in Indian Organisations. Leadership Effectiveness: Meaning, Reddins' 3-D Model, Hersey and Blanchard Situational Model, Driving Leadership Effectiveness, Leadership for Organisational Building.

Unit 2:

Leadership Motivation, Culture: Motivation Theories for Leadership: Maslow's, Herzberg, X, Y and Z theories of Motivation - Similarities and Distinctions of Need Hierarchy and Two Factors theories. ERG – McClelland - Expectancy - Porter and Lawler Theories. - Emerging Challenges in Motivating Employees. Motivation,Satisfaction,Performance.Organisational Culture: Meaning, Definitions, Significance, Dimensions, Managing Organisational Culture, Changing organisational Cultural.

Unit 3:

Leadership Development: Leadership development: Significance – Continuous Learning: Principles of learning to develop effective leadership – Vision and Goals for organisation: significance of goals for leaders – Charting vision and goals of Indian leaders and abroad - Tools for developing dreams for effective leadership dreams – Leaders vision in organisation building – Leadership Attitude: significance – Developing and Maintaining positive attitude for effective leading.

Unit 4:

Strategic Leadership: Leader Self management: significance - Developing self esteem and balancing emotions – Interpersonal Leadership Skills: Praise – Criticise – Communicate – Leadership Assertiveness: Circle of influence and circle of concern – Leadership with Edification: Tools of edification – Leadership and creativity: Developing creative thinking – Leadership and Team Building: Principles of team building, individual versus Group versus Teams – Leadership and Integrity: Developing character and values.

Unit 5:

Leadership in the cross cultural context: Leadership across Globe: Characteristics - Significance – Functions – GLOBE research program of Wharton School – challenges of leadership in varying culture and values – Global perspectives of leadership – Leadership in USA – Leadership in Japan – European leadership – Leadership in Arab countries – Implications of global leadership – Leadership and Corporate Social Responsibility across globe.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

Reference Books:

1. Peter G. Northouse, **Leadership,** 2010, Sage. Publication.
2. Richard L. Daft **"Leadership"** Cengage Learning 2005.
3. Uday Kumar Haldar **"Leadership and Team Building"** Oxford Higher Education 2010
4. Richard L Hughes, Robert C Ginnett, Gordon J Curphy **"Leadrship"** Tata Mc Graw Hill Education Private Limited 2012.
5. Peter Lornge, **Thought leadership Meets Business,** 1st edition, 2009, Cambridge.
6. John ADAIR, **Inspiring Leadership,** 2008, Viva Books.

HR ELECTIVE 2

Sub Code: 18E2198512 Name of the Course: COMPENSATION AND REWARD MANAGEMENT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. Learn basic compensation concepts and the context of compensation practice
2. Aware of the concept of job evaluation and compensation structure based on job evaluation.
3. Understand the concepts of wages, legal framework for wage and salary administration.
4. Identify the internal and external environmental factors that have an impact on the pay structure of an organization and steps for preparation of payroll, Wage analysis.
5. Acquainted with basic knowledge on Performance based and Pay based structures, Role of tax planning.

Course Outcomes

1. Apply basic compensation concepts and the context of compensation practice
2. Illustrate the concept of job evaluation and techniques of Job evaluation.
3. Exposed to the concepts of legal framework for wage and salary administration.
4. Demonstrate the internal and external environmental factors that have an impact on the pay structure of an organization.
5. Evaluate different types of pay structures, Significance of factors affecting pay structure, Tax Planning.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2				2						1	1
CO2	1				2					2			1	1
CO3	1					2		2					2	2
CO4	1	2		2			2	2		2	2		2	2
CO5	1					2		2					2	2
Tot	5	2	2	2	2	4	4	6		4	2		8	8
Avg.	1	2	2	2	2	2	2	2		2	2		1.6	1.6

Syllabus:

UNIT 1

Compensation: concept and definition – objectives and dimensions of compensation program – factors influencing compensation –Role of compensation and Reward in Modern organizations-

Compensation as a Retention strategy- aligning compensation strategy with business strategy – concept of reward - non-financial compensation system-Reward management process - Managing Compensation: Designing a compensation system – internal and external equity– pay determinants - frame work of compensation policy - influence of pay on employee attitude and behavior - the new trends in compensation management at national and international level.

UNIT 2

Job evaluation and Compensation Structure: Introduction to Principles and Procedures of job evaluation programs-Introduction to basic job evaluation methods-Compensation Structure-History and past practices, elements of ,management compensation –Types of compensation system, Role of compensation and Reward in modern organizations-compensation surveys-Incentive payments and its objectives.

UNIT 3

Wage and Salary administration: Nature and Purpose, Wage surveys-Administration of wage and salary-Principles-Components of wages-Theory of wages-Wage differentials-Importance-Wage differentials in India-Executive compensation plans-Legal frame work for wage and salary administration.

UNIT 4

Control systems for labour costs: Introduction-Direct and Indirect labour , Role of various departments-The personnel department-Industrial engineering department-Types of worker-Payroll department-Process and steps for preparation of payroll-Wage analysis-Cost accounting treatment of wages components-Compensation surveys-Profit sharing.

UNIT 5

Pay Structure and Tax Planning: Introduction- Compensation Structures-Performance based and Pay based structures-Designing pay structures-comparison in evaluation of different types of pay structures-Significance of factors affecting-Tax Planning –Concept of Tax planning-Role of tax planning in compensation benefits-Tax efficient compensation package-Fixation of tax liability salary restructuring.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. Kanchan Bhatia **"Compensation Management"**, Himalaya Publishing House, New Delhi 2012.
2. A.M.Sarma, N.Sambasiva Rao: "**Compensation and Performance management**", Himalaya Publishing House, Mumbai
3. Dewakar Goel:"**Performance Appraisal and Compensation Management**", PHI Learning, New Delhi, 2012
4. ER Soni Shyan Singh **'Compensation Management'** – Excel Books, New Delhi – 2008.
5. Mousumi S Bhattacharya Nilanjan Sengupta , **"Compensation Management"** – Excel Books, New Delhi – 2009
6. Tapomoy Deb **"Compensation Management"** – Excel Books, New Delhi – 2009

HR ELECTIVE 3

Sub Code: 18E2198513 Name of the Course: PERFORMANCE MANAGEMENT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. To understand the basic concepts of performance management and performance audit .
2. Acquainted with the performance management planning, its barriers and methods of competency mapping.
3. Familiarized with performance management system, different methods of performance appraisals and involve employees towards managing their performances.
4. To learn principles and process of monitoring, counseling, engendering trust role efficiency for improving their performance.
5. To know about operational change through performance management and team oriented organisations.

Course Outcomes

1. Apply the concept of Performance Management and its linkage to HR process and performance audit .
2. Able to evaluate performance management planning, its barriers and methods of competency mapping.
3. Exposed to different methods of performance appraisals and involve employees towards managing their performances.
4. Examine the monitoring process, role efficiency and counseling.
5. Able to develop and lead high performance teams

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2	2							2		1	1
CO2	1	2			2								1	1
CO3	1	2	2		2			2					2	2
CO4	1	2	2	2				2		2		2	2	2
CO5	1			2				2	2	2			2	2
Tot	5	6	6	6	4			6	2	4	2	2	8	8
Avg.	1	2	2	2	2			2	2	2	2	2	1.6	1.6

Syllabus:

Unit-1

Introduction: –Definition –concerns-scope-Historical developments in performance management-Over view of performance management-Process for managing performance-Importance –Linkage of PM to other HR processes-Performance Audit.

Unit-2

Performance Management Planning: Introduction-Need-Importance-Approaches-The Planning Process—Planning Individual Performance- Strategic Planning –Linkages to strategic planning-Barriers to performance planning-Competency Mapping-steps-Methods.

Unit-3

Management System: objectives – Functions- Phases of Performance Management System- Competency based Performance Management Systems- Reward based Performance Management Systems- Electronic Performance Management Systems- HR Challenges-Appraisal for recognistion and reward-Purpose of Appraising –Methods of Appraising-Appraisal system design-Implementing the Appraisal System-Appraisal and HR decisions.

Unit-4

Performance Monitoring and Counseling: Supervision- Objectives and Principles of Monitoring- Monitoring Process- Periodic reviews- Problem solving- engendering trust-Role efficiency- Coaching- Counseling and Monitoring- Concepts and Skills

Unit-5

Performance management skills – Operational change through performance management. High Performing Teams: Building and leading High performing teams – team oriented organizations – developing and leading high performing teams- Role of Leadership

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Prem Chadha: **"Performance Management"**, Macmillan India, New Delhi, 2008.
2. Michael Armstrong & Angela Baron, **"Performance Management":** The New Realities, Jaico Publishing House, New Delhi, 2010.
3. T.V.Rao, **"Appraising and Developing Managerial Performance"**, Excel Books, 2003.
4. David Wade and Ronad Recardo, **"Corporate Performance Management"**, Butter Heinemann, New Delhi, 2002.
5. Dewakar Goel: **"Performance Appraisal and Compensation Management"**, PHI Leaarning, New Delhi, 2009
6. A.M. Sarma **"Performance Management Systems"** Himalaya Publishing House, New Delhi, 2010.

HR ELECTIVE 4

Sub Code: **18E2198514** Name of the Course: **STRATEGIC HUMAN RESOURCE MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To understand the Theoretical Perspectives on SHRM approaches - Linking business strategies to HR strategies.
2. Aware of Activities related to strategic HR Planning.
3. Know the Reward and Performance management strategies.
4. Acquaint with the knowledge on Concept of Strategic Planning for HRD and overall effectiveness.
5. Familiarized with approaches to Human Resources evaluation, Evaluating Strategic contribution of Emerging Areas.

Course Outcomes

1. Examine the Theoretical Perspectives on SHRM approaches
2. Evaluate the Activities related to strategic HR Planning, Strategic HR Planning model-Components of the strategic plan
3. To implement Resourcing and Retention strategies-Reward and Performance management strategies
4. Apply Strategic HRD planning and practices at all levels in the organisation.
5. Inculcate the Evaluation of Strategic Contribution of Emerging Areas in HR.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2					2	1	1
CO2	1	2	2		2								1	1
CO3	1		2			2	2						2	2
CO4	1				2							2	2	2
CO5	1		2	2				2				2	2	2
Tot	5	2	6	2	4	4	4	2				6	8	8
Avg.	1	2	2	2	2	2	2	2				2	1.6	1.6

Syllabus:

UNIT-1

Human Resource Strategy: Introduction to Strategic Human Resource Management - Evaluation objectives and Importance of Human Resources Strategy- Strategic fit – A conceptual framework -Human Resources contribution to strategy - Strategy driven role behaviors and practices – Theoretical Perspectives on SHRM approaches - Linking business strategies to HR strategies.

UNIT-2

Strategic Human Resource Planning: Objectives, benefits, levels of strategic planning-Activities related to strategic HR Planning-Basic overview of various strategic planning models-Strategic HR Planning model-Components of the strategic plan.

UNIT-3

Strategy Implementation: Strategy implementation as a social issue-The role of Human Resource-Work force utilization and employment practices-Resourcing and Retention strategies-Reward and Performance management strategies.

UNIT-4

Strategic Human Resource Development: Concept of Strategic Planning for HRD-Levels in Strategic HRD planning-Training and Development Strategies-HRD effectiveness.

UNIT-5

Human Resource Evaluation: Overview of evaluation - Approaches to evaluation, Evaluation Strategic contributions of Traditional Areas - Evaluating Strategic Contribution of Emerging Areas-HR as a Profit centre and HR outsourcing strategy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Charles R. Greer: **"Strategic Human Resource Management"** - A General Manager Approach - Pearson Education, Asia
2. Fombrum Charles & Tichy: **"Strategic Human Resource Management"** - John Wiley Sons, 1984
3. Dr. Anjali Ghanekar **"Strategic Human Resource Management"** Everest Publishing House, Pune 2009
4. Tanuja Agarwala **"Strategic Human Resource Management"** Oxford University Press, New Delhi 2014
5. Srinivas R Kandula **"Strategic Human Resource Development"** PHI Learning PVT Limited, New Delhi 2009
6. Dreher, Dougherty **"Human Resource Strategy"** Tata Mc Graw Hill Publishing Company Limited, New Delhi 2008

FINANCE ELECTIVE 1

Sub Code: 18E2198521 **Name of the Course: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. Learn basic concepts of investment, trading system and types of risk.
2. Aware of equity and bond valuation theorems.
3. Acquainted with Fundamental Analysis and Technical Analysis.
4. Familiarized with Elements of Portfolio Management, Portfolio Models
5. Understand Performance Evaluation of Mutual Fund , Portfolio Revision.

Course Outcomes

1. Evaluate Investment alternatives measurement of Return and Risk.
2. Apply the knowledge of Preference Shares and Equity Shares and Bond Pricing Theorems
3. Apply Fundamental Analysis and Technical Analysis.
4. Analyze portfolio models and selection of portfolios.
5. Aware of Evaluation of Mutual Funds.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2										1	1
CO2	1	2	2										1	1
CO3	1	2	2	2	2							2	2	2
CO4	1	2	2	3	2						2	2	2	2
CO5	1	2	2	2	2						2	2	2	2
Tot	5	10	10	7	6						4	6	8	8
Avg.	1	2	2	2.33	2						2	2	1.6	1.6

Syllabus:

Unit-I:

Concept of Investment Education: Investment Vs Speculation, Investment alternatives - Investment Process - Sources of Investment Information – Trading System in Stock Exchanges –Market Indices. Calculation of SENSEX and NIFTY - Return and Risk – Meaning and Measurement of Security Returns. Meaning and Types of Security Risks:

Systematic Vs Non-systematic Risk - Measurement of Risk. (Problems)

Unit-II:

Equity and Bond Valuation Models – Preference Shares and Equity Shares Earning valuation-Cash flow valuation-Asset Valuation-Dividend-discount model; Valuation of Bonds – Bond Returns and Risks -Bond Pricing Theorems convexity, duration, bond immunization. (Problems)

Unit-III:

Investment Analysis: Fundamental Analysis – Economy, Industry and Company Analysis, Technical Analysis – Dow Theory – Elliot Wave Theory – Trends and Trend Reversals - Efficient Market Theory –Hypothesis- Forms of Market Efficiency.

Unit-IV:

Portfolio Analysis and Selection: Elements of Portfolio Management, Portfolio Models – Markowitz Model, Efficient Frontier and Selection of Optimal Portfolio. Sharpe Single Index Model and Capital Asset Pricing Model, Arbitrage Pricing Theory. (Problems)

Unit-V:

Portfolio Evaluation and Revision: Performance Evaluation of Portfolios; Sharpe Model – Jensen's Model for PF Evaluation, Evaluation of Mutual Fund -- Portfolio Revision. (Problems)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. S.Kevin: **"Security Analysis and Portfolio Management"**, PHI Learning, New Delhi, 2009

2. Punithavathy Pandian: **"Security Analysis and Portfolio Management"**, Vikas Publishing House, New Delhi, 2009

3. Sudhendra Bhat: **"Security Analysis and Portfolio Management"**, Excel Books, New Delhi, 2009.

4. Shashi K Gupta: **"Security Analysis and Portfolio Management"**, Kalyani Publishers, New Delhi,2010

5. Prasanna Chandra, **"Investment Analysis and Portfolio Management"**, 3/e Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2003.

6. Ranganatham : **"Investment Analysis and Portfolio Management"** Pearson Education.

FINANCE ELECTIVE 2

Sub Code: **18E2198522** Name of the Course: **BANKING AND INSURANCE MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. Know the concepts Indian Financial System, role of commercial banks, Financial statement analysis of banks.
2. Gain knowledge on Bank Credit, Loan Pricing, Non Performing Assets.
3. Understand the Regulation and Innovations in Banking System.
4. Acquainted with concept of Insurance, marketing channels of Insurance and overview of IRDA.
5. Learn the concept of Life Insurance, Health and General insurance–Overview.

Course Outcomes:

1. Examine Financial statement analysis of banks CAMEL Approach, Key Performance indicators,
2. Aware of assessment of credit worthiness of a prospective borrower, loan pricing, Customer Profitability Analysis, NPA.
3. Evaluate the Concept of Regulatory Capital, Basel Accords I,II and III. - Banking Innovations.
4. Aware of concept of Insurance, marketing channels of Insurance, IRDA.
5. Examine the concept of Life Insurance, Health and General insurance–Overview.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2											1	1
CO2	1			2									1	1
CO3	1	2	2			2	2						2	2
CO4	1			2		2	2					2	2	2
CO5	1	2		2								2	2	2
Tot	5	6	2	6		4	4					4	8	8
Avg.	1	2	2	2		2	2					2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Banking: Introduction to Indian Financial System - Meaning of a Bank and Customer- Bank and customer Relationship - Role of commercial banks in Economic Development - Evolution of Banking in India – origin, nationalization, reforms and Financial Inclusion in India - Financial statements of banks with special focus on Indian banks - Financial statement analysis of banks: CAMEL Approach, Key Performance indicators- Sources of Bank Funds.

UNIT 2

Uses of Bank Funds: Features of Bank Credit - types of lending - assessment of credit worthiness of a prospective borrower - management of credit process - different types of loans and their features - Loan Pricing: The basic model, pricing fixed & floating rate loans, cost-benefit loan pricing, Customer Profitability Analysis - Non Performing Assets: - gross and net concept of NPAs, causes, implications & recovery of NPAs.

UNIT 3

Regulation and Innovations in Banking System: Regulation of Bank Capital: The need to regulate Bank Capital - Concept of Economic Model - Concept of Regulatory Capital, Basel Accords I,II and III. - Banking Innovations - Core Banking Solution - Retail Banking - Products & Services: Nature, Scope, Future and Strategies - Plastic Money - National Electronic Funds Transfer - ATM - Mobile Phone Banking - Net Banking- Banc-assurance. Changing role of Banks as Financial Intermediaries. Customer service quality in Indian banking industry.

UNIT 4

Introduction to Insurance: Insurance as a Risk Management Tool- Principles of Insurance - Characteristics of Insurance contract - Functions of Insurers: Production, Underwriting, Rate Making, Managing Claims and Losses, Investment & Financing, Accounting & Record Keeping and other miscellaneous functions - Types of Insurers- Concept of Reinsurance, uses and advantages - Marketing channels: Agents & brokers –professionalism, remuneration, responsibilities, classification, criteria for appointment and capital adequacy norms for broker - an overview of IRDA.

UNIT 5

Life Insurance and General Insurance: The concept of Life Insurance - types of Life Insurance contracts - Tax treatment of Life Insurance- Life Insurance Products-Classification of Life Insurance - The Actuarial Science- Provisions of Life Insurance contracts - Special Life Insurance forms - Health and General insurance–Overview, Types, Third Party Administrators- Micro Insurance in India

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Peter.S.Rose & Sylvia. C. Hudgins: **"Bank Management & Financial Services"**, Tata McGraw Hill New Delhi, 2010,
2. James S. Trieschmann, Robert E. Hoyt & David. W. Sommer B:**"Risk Management & Insurance"**, Cengage Learning, New Delhi
3. Reddy K S and Rao R N: **"Banking & Insurance"**, Paramount Publishing House 2013.
4. Vasant Desai: **"Banks & Institutional Management"**, Himalaya Publishing House 2010.
5. Harold. D. Skipper & W. Jean Kwon: "Risk **Management & Insurance, Perspectives in a Global Economy"**, Blackwell Publishing New Delhi.
6. NIA: **"Life Insurance Principles and Practices"**, Cengage Learning, New Delhi,2013.
7. Neelam C.Gulati: **"Banking and Insurance: Principles and Practice"**, Excel Books, New Delhi 2011.

FINANCE ELECTIVE 3

Sub Code: **18E2198523** Name of the Course: **ADVANCED MANAGEMENT ACCOUNTING**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. Understand the concept of Employment of Management Accounting, Human Resource Accounting.
2. Learn about Financial Analysis, depreciation models.
3. Know the budget concepts and budgetary control techniques.
4. Acquainted with Cost Concepts for Decision making and profit planning.
5. Understand Standard Costing, historical costing , Variance analysis.

Course Outcomes:

1. Examine the concept of Employment of Management Accounting, Human Resource Accounting, FACO.
2. Analyse the financial statements.
3. Construct various types of budgets, management control and budgeting
4. Aware of Marginal Cost concepts for decision making and for profit planning,
5. Apply the concepts of Standard Costing and variance analysis.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1												1	1
CO3	1	2	2								2		2	2
CO4	1	2	2	2	2	2					2	2	2	2
CO5	1	2	2	3							2		2	2
Tot	5	6	6	5	2	2					6	2	8	8
Avg.	1	2	2	2.5	2	2					2	2	1.6	1.6

Syllabus:

Unit – 1:

Introduction: Employment of Management Accounting – Human Resource Accounting – Need for Harmonization of International Accounting Standards – Role of Management Accountant for controller functions – Financial Accounting Control (FACO)-Management information System.

Unit - 2:

Financial Analysis: Comparative analysis – Common Size Analysis - Funds Flow Analysis – Cash Flow Analysis.-Ratio Analysis – Trend analysis – Deprecation Models.

Unit- 3:

Budget – Budgetary Control: – Types of Budgets – Financial Vs Operation Budgets – Short Term Vs Long Term Budgets – Preparation of Sales Budgets – Purchase Budgets- Expenditure Budgets for Material, Labour and Overheads – Construction of Cash Budget- Flexible Budget – Master Budget – Management Control and Budgeting – Performance Budgeting and Zero Based Budgeting.

Unit-4:

Marginal Costing: Cost Concepts for Decision making – Decision Making Process – Decision Situations-Sales Volume Decisions – Pricing and Special Order Pricing – Make / Buy Decisions – Product Decisions- Addition, Deletion and Alteration of Mix – Plant Shutdown Decision - Profit Planning- introduction of new product – planning of level of activity – Key factor – Foreign market offer .

Unit – 5:

Standard Costing: Standard Costing and historical costing – Establishment of cost standards – steps involved in standard costing – Variance analysis: Material Variance – Labour Variance – Overhead Variance - Sales Variance

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Charles T. Horn Gaxy L. Sundem.: "**Introduction to Management Accounting**" Konrk Publishers PVT Ltd, New Delhi.
2. S.P. Gupta: "**Management Accounting**" Sahitya Bhawan Publications, Agra 2002.
3. Manmohan and Goyal: **"Management Accounting"** Pearson Education.
4. V. Krishna Kumar: **"Management Accounting"** Mittal Publications, New Delhi.
5. Dr. Kulsreshtha and Gupta: **"Practical Problem in Management Accounting"** Tata Mc Graw Hill, New Delhi.
6. S.P. Jain and K.L. Narang: **"Advanced Cost and Management Accounting"** Kalyani Publishers, New Delhi.

FINANCE ELECTIVE 4

Sub Code: 18E2198524 **Name of the Course:** STRATEGIC FINANCIAL MANAGEMENT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. Understand the concepts of Strategic Financial Planning & Corporate Risk Management.
2. Learn the concepts of Capital Structure Planning, Dividend Policy and Value of the Firm.
3. Know the Techniques of Investment Appraisal Under Risk and Uncertainty, leasing vs borrowing, Decision Tree Approach for Investment Decisions.
4. Inculcate concepts of Merger strategy, Merger Procedure, Financial Impact of Merger.
5. Understand Corporate Restructuring like Takeover Strategy, Leveraged Buyouts, Distress Restructuring Strategy.

Course Outcomes:

1. Examine the concepts of Strategic Financial Planning, & Corporate Risk Management.
2. Apply the concepts of Capital Structure Planning, Dividend Policy and Value of the Firm.
3. Apply the knowledge of Techniques of Investment Appraisal Under Risk and Uncertainty, Decision Tree Approach for Investment Decisions.
4. Relate concepts of Merger strategy, Merger Procedure, Financial Impact of Merger.
5. Evaluate Corporate Restructuring like Takeover Strategy, Leveraged Buyouts, Distress Restructuring Strategy.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1	2	2	2							2		1	1
CO3	1	2		2	3						2		2	2
CO4	1	2	2	2			2				2	2	2	2
CO5	1	2	3	2			2				2	2	2	2
Tot	5	8	7	8	3		4				8	4	8	8
Avg.	1	2	2.3	2	3		2				2	2	1.6	1.6

Syllabus:

Unit-I:

Corporate Policy: Strategic Financial Planning- changing complexion of regulatory framework - Shareholder Value Creation (SCV): Market Value Added (MVA) – Market-to-Book Value (M/BV) – Economic Value Added (EVA) – Managerial Implications of Shareholder Value Creation- Corporate Risk Management – Understanding the firms Strategic Exposure.

Unit-II:

Corporate Financial Strategies: Capital Structure Planning- EBIT,EPS,ROE analysis-Shareholders' Risk — Financial Options and Value of the Firm – Dividend Policy and Value of the Firm – Growth and External Financing Requirement. (Problems)

Unit-III:

Corporate Investment Strategy: Techniques of Investment Appraisal Under Risk and Uncertainty – Risk Adjusted Net Present Value – Risk Adjusted Internal Rate of Return – Capital Rationing – Decision Tree Approach for Investment Decisions – Evaluation of Lease Vs Borrowing Decision- Long term investment plans analysis with risk and return. (Problems)

Unit-IV:

Corporate Financial Engineering: Merger Strategy – Theories of Mergers – Horizontal and Conglomerate Mergers – Merger Procedure – Valuation of Firm – Financial Impact of Merger – Merge and Dilution Effect on Earnings Per Share – Merger and Dilution Effect on Business Control. (Problems)

Unit-V:

Corporate Restructuring: Takeover Strategy – Types of Takeovers – Negotiated and Hostile Bids – Takeover Procedure – Takeover Defenses – Takeover Regulations of SEBI – Distress Restructuring Strategy – Sell offs – Spin Offs – Leveraged Buyouts- Buy back shares – Alignment of Interest – Corporate Governance . (Problems)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Coper and Weston: **"Financial Theory and Corporate Policy"**
2. Braley and Myers: **"The Principles of Corporate Finance"**. Mc.Graw Hill, N.Y.1993.
3. Prasanna Chandra : **"Financial Management"** Theory and Practice.
4. I.M. Pandey – **"Financial Management"** Vikas Publishers, New Delhi.

MARKETING ELECTIVE 1

Sub Code: 18E2198531 **Name of the Course: CONSUMER BEHAVIOR**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. To learn the concept of consumer behavior and Models of Buyer Behavior
2. To know the Psychological Foundations of Consumer Behavior, Attitude Formation, Cultural Influences.
3. Understand the Components of communications process, Consumer Decision Processes High and Low Involvement.
4. Acquainted with knowledge on Consumerism and legislative responses to consumerism.
5. Familiarized with Consumer Protection Act 1986 and consumer disputes redressal agencies.

Course Outcomes:

1. Examine the concept of consumer behavior and Models of Buyer Behavior
2. Evaluate the Psychological Foundations of Consumer Behavior, Attitude Formation, Cultural Influences.
3. Relate the Components of communications process, Consumer Decision Processes.
4. Aware of Consumerism and marketer responses to consumer issues.
5. Demonstrate how knowledge of Consumer Protection Act 1986 and consumer disputes redressal agencies can apply.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2			2				2				1	1
CO2	1		3			2							1	1
CO3	1	2		2						2			2	2
CO4	1	2				2		2				2	2	2
CO5	1	2		2		2		2				2	2	2
Tot	5	8	3	4	2	6		4	2	2		4	8	8
Avg.	1	2	3	2	2	2		2	2	2		2	1.6	1.6

Syllabus:

UNIT-1

Introduction to Consumer Behavior: Understanding consumers and market segments. Evolution of consumer behavior, consumer analysis and business strategy. Models of Buyer Behavior, Howard Model, Howard- Sheth Model, EKB Model, Webster and Wind Model and Sheth Industrial Buyer Behavior Model.

UNIT- 2

Psychological Foundations of Consumer Behavior: Consumer Motivation, Perception, Personality and Behavior, Learning and Behavior Modification, Information Processing, Memory Organization and Function, Attitude Formation and Attitude Change. Social and Cultural Environment Economic, Demographic, Cross Cultural and Socio–Cultural Influences, Social Stratification, Reference Groups and Family, Personal influence.

UNIT- 3

Communication and Consumer Behavior: Components of communications process, designing persuasive communication and Diffusion of Innovations. Consumer Decision Processes High
and Low Involvement, Pre-purchase Processes, Post Purchase processes, Consumption and evaluation, Brand Loyalty and Repeat Purchase Behavior.

UNIT -4

Consumerism: The roots of consumerism, consumer safety, consumer information, environmental concerns, consumer privacy, legislative responses to consumerism and marketer responses to consumer issues.

UNIT- 5

Consumer Protection: Consumer Protection Act 1986, Central consumer protection council, state consumer protection councils, consumer disputes redressal agencies, consumer disputes redressal forum, National Consumer Disputes Redressal Commission.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ramneek Kapoor, Nnamdi O Madichie: **"Consumer Behavior"** Text and Cases", TMH, New Delhi, 2012.
2. Ramanuj Majumdar: **"Consumer Behavior insight from Indian Market"**, PHI Learning, New Delhi, 2011
3. M.S.Raju: **"Consumer Behavior Concepts, applications and Cases"**, Vikas Publishing House, New Delhi, 2013.
4. David L Loudon and Albert J Della Bitta, **"Consumer Behavior"** 4/e, TMH, New Delhi, 2002.
5. Schiffman, L.G and Kanuk L.L **"Consumer Behavior"**, 8/e, Pearson Education, New Delhi, 2003.

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MARKETING ELECTIVE 2

Sub Code: 18E2198532	**Name of the Course:** RETAIL MANAGEMENT		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives :

1. To know the basic concept of retailing and legislation for retailing in India.
2. To understand Retail strategy and strategic retail planning process.
3. Acquainted knowledge with Retail location strategic profit model and setting and measuring performance objectives.
4. Learn Store operations and inventory management, Developing Assortment plan
5. Familiarized with Retail Pricing Strategy and Promotional strategies

Course Outcomes:

1. Aware of the basic concept of retailing and legislation for retailing in India
2. Examine Retail strategy and strategic retail planning process
3. Apply the knowledge with Retail location strategic profit model and setting and measuring performance objectives
4. Evaluate Store operations and inventory management, Developing Assortment plan
5. Demonstrate Retail Pricing Strategy, International retailing and Promotional strategies

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2						1	1
CO2	1	2		2			2						1	1
CO3	1		2			2	2						2	2
CO4	1		3	2									2	2
CO5	1			2		2	2			2		2	2	2
Tot	5	2	5	6		6	8			2		2	8	8
Avg.	1	2	2.5	2		2	2			2		2	1.6	1.6

Syllabus:

UNIT 1

Basic concept of retailing: Retail development – types and functions of retailers – multi channel retailing – organized retailing in India – special characteristics of retailing services retailing-legislation for retailing in India.

UNIT 2

Retail strategy: market strategy – retail format and target market – building sustainable competitive advantage – growth strategies – strategic retail planning process.

UNIT 3

Retail location – Types, location opportunities – selection of location and Site analysis - financial strategy – strategic profit model – setting and measuring performance objectives.

UNIT 4

Store layout and design: Store operations and inventory management- Merchandise planning and control - Buying merchandise – Developing Assortment plan.

UNIT 5

Retail Pricing Strategy:, Category Management, Customer services – Retail branding - International retailing – Promotional strategies – advertising, sales promotion, Store atmosphere.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Sheikh and Kaneez Fatima, "**Retail Management**", Himalaya Publishing House, Mumbai, 2012
2. A.J. Lamba:"**The Art of Retailing**", Tata McGraw Hill Education Pvt. Ltd. New Delhi.2011
3. Sivakumar, A, "**Retail Marketing**", Excel Books, New Delhi, 2007
4. Swapna Pradhan, "**Retail management**", Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2012
5. Berman Barry, Joel R. Evans and Mini Mathur, "**Retail Management-A Strategic Approach**", Pearson Education, New Delhi, 2011.
6. Chetan Bajaj RajnishTuli, Nidhivarma Srivastava:"**Retail Management**", Oxford University Press, New Delhi, 2012.

MARKETING ELECTIVE 3

Sub Code: 18E2198533	**Name of the Course:** CUSTOMER RELATIONSHIP MANAGEMENT		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To know the concept of Planning and Managing CRM Programme
2. Learn CRM as an integrated business strategy
3. Familiarized with Customer knowledge, multi-channels and communication, formation of relationships
4. Know Relationship data management, Concept of customer loyalty, Customer Retention strategies.
5. Understand the concept of Operational CRM and CRM implementation.

Course Outcomes:

1. Examine the concept of Planning and Managing CRM Programme.
2. Evaluate CRM as an integrated business strategy.
3. Aware of Customer knowledge, multi-channels and communication, formation of relationships
4. Apply Relationship data management, Concept of customer loyalty, Customer Retention strategies
5. Examine the concept of Operational CRM and CRM implementation

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2				2							1	1
CO2	1	2	2		2								1	1
CO3	1	2		2			2	2		2			2	2
CO4	1	2				2	2	2					2	2
CO5	1	2	2		2		2	2		2			2	2
Tot	5	10	4	2	4	4	6	6		4			8	8
Avg.	1	2	2	2	2	2	2	2		2			1.6	1.6

Syllabus:

UNIT 1

Introduction: Definition of CRM –Elements of CRM – CRM Processes and systems, Importance of CRM, Critical success factors for a winning CRM program – Advantages of CRM – Integrated CRM system –Planning and Managing CRM Programme - Application areas.

UNIT 2

CRM as an integrated business strategy: Nature of CRM strategy – Contents of CRM Strategy – Description of Customer – Supplier Relationships, The dynamics of Relationships, The relationship oriented organization.

UNIT 3

CRM marketing aspects: Customer knowledge, value of customer knowledge, utilization of data as an asset, multi-channels and communication- Influence of the channels on pricing and the formation of relationships – The relationship policy to improve size, quality and relationship with the customer base.

UNIT 4

Analytical CRM: Relationship data management – Expanding the size of customer database - Data analysis and data mining – Concept of customer loyalty – customer value assessment – Customer Retention strategies – Retention and Cross – sell analyses – effect of marketing activities – Reporting the results

UNIT 5

Operational CRM and CRM implementation: Call center Management – internet and the websites – traffic building – Providing quality during the visit to the website – Process of developing, producing, sending and following – up direct mailings. Causes for disappointing CRM results – The best CRM implementation strategies –Privacy and ethics Consideration in CRM implementation.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Ed Peelen: **"Customer Relationship Management"** Pearson, Education

2. Roger J Baran, Robert J Galka and Daniel P Strunk: **"Customer Relationship Management"** Cengage learning

3. S.Shanmuga sundaram: **"Customer Relationship Management"** Prentice Hall of India.

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MARKETING ELECTIVE 4

Sub Code: **18E2198534** Name of the Course: **STRATEGIC MARKETING MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To know the concepts of Role of Strategic Marketing, Processes, Formulation and Implementation and Control Links to corporate strategy.
2. To understand strategic marketing models, Marketing Audit, Marketing Tactics, Personalised marketing.
3. Emphasized Strategic Marketing Techniques, Innovation strategies, Strategic marketing objectives.
4. Familiarized with Strategic marketing environment, new constraints Strengths and weaknesses.
5. Know the concept of New Product Developments, Strategic marketing responses.

Course Outcomes:

1. Examine the Role of Strategic Marketing, Processes, Formulation and Implementation and Control Links to corporate strategy.
2. Aware of strategic marketing models, Marketing Audit, Marketing Tactics, Personalised marketing.
3. Apply Strategic Marketing Techniques, Innovation strategies, Strategic marketing objectives.
4. Evaluate Strategic marketing environment, new constraints Strengths and weaknesses.
5. Relate the concept of New Product Developments, Strategic marketing responses.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2	2			2						1	1
CO2	1			2	2								1	1
CO3	1		2	2		2							2	2
CO4	1		3			2	2						2	2
CO5	1	2					2				3	2	2	2
Tot	5	2	7	6	2	4	6				3	2	8	8
Avg.	1	2	2.3	2	2	2	2				3	2	1.6	1.6

Syllabus:

UNIT – 1

Introduction : Role of Strategic Marketing - Key Definitions of Strategic Marketing - Role and Importance and concepts- Systematic approach - sequencing and scheduling of activities and integration of activities - Resource Requirements – Time scaling - Processes: Strategic Marketing Planning Process - Strategic Marketing Analysis- marketing strategy objective setting- perceptual mapping - factor analysis, Option Evaluation, Choice – Formulation and

Implementation and Control Links to corporate strategy: Mission statement, organisational structure and corporate responsibility and ethics - dynamic strategy

UNIT -2

Strategic Marketing Strategy: Models - Organisation, Industry and market environment situation analysis; Porter's Five Forces model - Structure, Conduct and Performance; - Marketing Audit - portfolio analysis techniques -strategic positioning, defining the future position - Marketing Tactics - Product tactics -Price tactics- Promotion tactics - Place tactics- Direct response marketing strategies - Defensive strategies - Customer retention strategies- Personalised marketing; Payne and Ballantyne's Six markets model

UNIT -3

Strategic Marketing Techniques : Setting marketing objectives and marketing strategy - Targeting markets - Segmenting markets - Profiling markets- Positioning segmented markets, Direct or Indirect sales Strategy options - core competences - Competitive advantage - Investment opportunity evaluation - market leadership - Innovation strategies - Market pioneer - close followers, late followers; offensive, defensive and value-based marketing strategies Strategic marketing objectives: marketing mix – 7 Ps.

UNIT -4

Strategic marketing environment : Changes in the external environment: shift from supply to demand environment; fashionisation of markets; micro-markets; rising expectations; technological change; competition; globalisation; importance of customer service; commoditisation; erosion of brands; new constraints Strengths and weaknesses: focus of marketing objectives, links to corporate strategy.

UNIT - 5

New Product Developments: Ability to customize - Ability to handle information to gain competitive advantage - e-marketing position - core focus - target markets, nature and potential of key market segments, partnerships with customers and other stakeholders- Innovation strategies, timescales, resource requirements, budgets, monitoring, review and control mechanisms Strategic marketing responses: emerging themes eg impact of globalisation, the strength or weakness of competitors, importance of environmental factors, changes in the political environment, the state of the economy, the exchange rate, health and safety factors

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Devid A Aaker and Damien Mc Loughlior: **"Strategic Marketing Management"**- Global Perspective" Wiley Publications.
2. Jean –Jacques Lambin : **"Strategic Marketing Management"**, McGraw –Hill,
3. Nag A: **"Strategic Marketing"**. MacMillons
4. Srinivas R, Lohith C.P.: **"Strategic Marketing and Innovation"** for Indian MSMEs", Springer Publication.
5. Graeme Drummond, John Ensor, Ruth Ashfor: **"Strategic Marketing Planning and Control"**, Elsevier Publication.
6. Kotler P and Keller K L: **"A Framework for Marketing Management"**, Pearson Education, 2008

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SYSTEMS ELECTIVE 1

Sub Code: 18E2198541 **Name of the Course: E-BUSINESS**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To explain a framework for understanding E-Business.
2. To understand the E-Business Models, Implementation and Control of the E-Business Plan.
3. To apply various Smart Cards and e-Billing developing payment standards.
4. To focus on Internet Marketing.
5. To incorporate focus on Cyber Crime – Internet Taxation Issues.

Course Outcomes:

1.To acquire necessary knowledge on E-Business.
2.To create awareness on E-Business Models, Implementation and Control of the E-Business Plan.
3.To analyse Digital Currency and Alternate Consumer Payment Options.
4.To improve the E-Customer Relationship Management on Internet Marketing.
5.To Apply knowledge to on Cyber Crime – Internet Taxation Issues

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2										1	1
CO2	1	2										2	1	1
CO3	1	3											2	2
CO4	1	2											2	2
CO5	1					2		2				2	2	2
Tot	5	7	2			2		2				4	8	8
Avg.	1	2.3	2			2		2				2	1.6	1.6

Syllabus:

UNIT 1

Introduction to E-Business: Transitioning to the Web – E-Business and E-Commerce overview History of Internet and World Wide Web – Web development Internet and World Wide Web Resources. A Framework for understanding E-Business.

UNIT 2

E-Business Models: Storefront Models, Auction Model, Portal Model and Dynamic-Pricing Models. B2B E-Commerce and EDI. Understanding Online Communication and Behavior. Creating the Marketing Mix – Organizational and Managerial Issues. Implementation and Control of the E-Business Plan.

UNIT 3

Building an E-Business: Design and Development and Management – E-Business Solutions - Online Monetary Transactions. e-Wallets – Digital Currency and Alternate Consumer Payment Options .Smart Cards, e-Billing developing payment standards.

UNIT 4

Internet Marketing: Branding, Promotions, E-Business Advertising – E-Customer Relationship Management – Tracking and Analyzing data, Personalization – Contact Centers Complete e-CRM Solutions

UNIT 5

Legal and Ethical Issues: Privacy and confidentiality on the Internet Other Legal areas like Defamation IPR and Patents, Trade mark Unsolicited Commercial e-Mail (Spam) Online Contracts and User Agreements. Cyber Crime – Internet Taxation Issues

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Hanson: **"E-Commerce and Internet Marketing"**, Cengage Learning, New Delhi, 2013
2. Harvey M. Deitel, Paul J. Deitel, Kate Steinbuhler: **"E-Business and E-Commerce"** for Managers, Pearson Publication.
3. David Whiteley: **"E-Commerce- Strategy Technologies and Applications"** Tata Mac-Graw Hill, New Delhi, 2000.
4. C.S.V.Murthy: **"E-Commerce–Concepts, Models & Strategies"** Himalaya Publishing house, Mumbai, 2003.
5. Kamalesh K Bajaj & Debjani Nag: **"E-Commerce"**, the Cutting Edge of Business- Tata McGraw- Hill, New Delhi, 2002.
6. Bharat Bhaskar: **"Electronic Commerce"**,Tata Mc-Graw-Hill, New Delhi, 2003.

SYSTEMS ELECTIVE 2

Sub Code: **18E2198542**	Name of the Course: **RELATIONAL DATA BASE MANAGEMENT SYSTEMS (RDBMS)**		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. The objective of this course is to enable the students Database Models and Database development.
2. To create awareness about Principles of Conceptual Database and Relational Database Implementation- Relational Algebra and Calculus.
3. To learn SQL-Schema and Table Definition.
4. To give an idea about Physical Database Systems.
5. To help the student to focus on Distributed Database Systems.

Course Outcomes:

1. To evaluate the Database Models and Database development.
2. To design and formulate various Principles of Conceptual Database and Relational Database Implementation- Relational Algebra and Calculus
3. To understand SQL-Schema and Table Definition
4. To design a Physical Database Systems
5. To analyse DBMS Selection and Implementation and Classifying DBMS featurerequirement Evaluation Models

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2				2							1	1
CO2	1		3			2	2					2	1	1
CO3	1												2	2
CO4	1		2			2	2						2	2
CO5	1	2	2			2	2					2	2	2
Tot	5	4	7			8	6					4	8	8
Avg.	1	2	2.3			2	2					2	1.6	1.6

Syllabus:

UNIT - 1

Database Systems: Evolution- File Oriented Systems- Database Models- database System Components- Database Systems in the Organization- Data sharing - Strategic Database - Planning database and Management Control- Risks and Costs in Databases- Database development.

UNIT - 2

Database Design: Principles of Conceptual Database- Design Conceptual Data Models- Aggregation- Modeling conceptual Objects vs. Physical Objects- Relational Data Model- Fundamental Concepts-Normalization-Transforming a conceptual model - Relational Model- Relational Database Implementation- Relational Algebra and Calculus.

UNIT - 3

SQL-Schema and Table Definition: Data Manipulation- View Definition Graphical Query Language- Client-Server Databases - Defining Database Tables and Server - Data Manipulation and Programming- Developing Client Applications

UNIT - 4

Physical Database Systems: Storage Media- Disk Performance – Factors File Organisation- Implementing Logical Relationships- Mapping logical Data Structures to Physical Structures- Secondary Keys – Access Database Administration and Control - DBA Functions- DBA Goals Database Integrity- Database Security- Database Recovery

UNIT - 5

Distributed Database Systems: Design. - Query Processing- Data Integrity Recovery- Client/Server Systems- DBMS Selection and Implementation- Information Needs- DBMS Functions and Capabilities-Classifying DBMS feature requirement Evaluation Models- Implementation Issues- Case studies of RDBMS package such as ORACLE/MS-SQL Server.

(Lab Sessions to be conducted wherever it is required)

REFERENCES:

1. Mc Fadden-Benjamin: **"Modern Database Management"** Cummings Publishing Company.
2. Bipin C.Desai: **"An Introduction to Database System"** West Publishing Company
3. Gary Hansen & James. Hansesn: **"Database Management & Design"** Prentice Hall
4. Alexis Leon & C.K. Thomas DB2 (IBM Database 2), **"The Complete Book for Application Programmers"**, Comdex Computer Publication a division of Pustak Mahal.
5. Prof. S. Nandagopalan, **"Database Management Systems"** A Practical Approach", Sapna Book House, Bangalor.

SYSTEMS ELECTIVE 3

Sub Code: **18E2198543** Name of the Course: **WEB DESIGNING**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To explain the Web Fundamentals.
2. To learn the Hyper Text Transfer Protocol (HTTP).
3. To provide a framework about Hyper Text Markup Language (HTML).
4. To create awareness about Cascading Style Sheets (CSS).
5. To demonstrate the knowledge about the concepts of JavaScript

Course Outcomes:

1. To understand the Web Fundamentals.
2. To know about the concept of Hyper Text Transfer Protocol (HTTP).
3. To be acquainted Hyper Text Markup Language (HTML).
4. To well versed with Cascading Style Sheets (CSS).
5. To acquire the knowledge about the concepts of JavaScript

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2						1	1
CO2	1	2				2	2					3	1	1
CO3	1	2	2			2						2	2	2
CO4	1	2	2										2	2
CO5	1	2				2						2	2	2
Tot	5	8	4			8	4					7	8	8
Avg.	1	2	2			2	2					2.3	1.6	1.6

Syllabus:

Unit: 1

Web Fundamentals – Introduction To The Web, History of the Web, Protocols Governing the Web, Creating Websites for Individuals and the Corporate World, Web Applications, Writing Web Projects, Identification of Objects, Target User, Web Team, Planning and Process Development, Web Architecture, Major Issues in the Web Solutions Development, Web Servers (Apache Web Server), Web Browsers, Internet Standards, TCP/IP Protocol Suite, IP Addresses, MIME, Cyber Laws.

Unit: 2

Hyper Text Transfer Protocol (HTTP): Introduction - Web Server and Clients, Resources, URL and its Anatomy – Examples, Message Format, Persistent and Non-Persistent Connections, Web Caching, Proxy. Java Network Programming- Java and the Net, Java Networking Classes and Interfaces, Looking up Internet Address, Client/Server Programs, Socket Programming, E-mail Client.(lab sessions to be conducted)

Unit 3

Hyper Text Markup Language (HTML): Introduction, Structure, Text, Lists, Links, Images, Tables, Forms, Frames, Images, and Meta Tags. (lab sessions to be conducted)

Unit 4

Cascading Style Sheets (CSS) Introduction, Advantages, Color, Text, Boxes, Lists, Tables and Forms, Layout, Images, HTML5 Layout. (Lab Sessions to be conducted)

Unit 5

JavaScript Introduction, Variables, Literals, Operators, Control Structure, Conditional Statements, Arrays, Functions, Objects, JavaScript and HTML DOM, Advanced JavaScript and HTML Forms (Lab sessions to be conducted).

(Lab Sessions to be conducted wherever it is required)

TEXT BOOKS:

1. Uttam K Roy : **"Web Technologies"** — Oxford University Press, 2010
2. Jon Duckett: **"HTML & CSS: Design and Build Websites"** – John Wiley & Sons, 2014.

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SYSTEMS ELECTIVE 4

Sub Code: **18E2198544** Name of the Course: **SYSTEMS ANALYSIS AND DESIGN**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To create awareness about conceptual Systems Analysis and Tools of System development.
2. To understand areas of System Design and Information Technology Architecture.
3. To acquire knowledge of Procedure Design.
4. To provide student with thorough understanding of Quality Assurance and Training the users and operating personnel.
5. To understand the Strategies and Techniques Conversion Methods and System Evaluation Techniques.

Course Outcomes:

1. To know about the conceptual Systems Analysis and Tools of System development.
2. To create awareness on areas of System Design and Information Technology Architecture.
3. To apply knowledge of Procedure Design.
4. To discuss various aspects on Quality Assurance and Training the users and operating personnel.
5. To analyse the Strategies and Techniques Conversion Methods and System Evaluation Techniques.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2										1	1
CO2	1					2	2					2	1	1
CO3	1	2										2	2	2
CO4	1		2										2	2
CO5	1											2	2	2
Tot	5	4	4			2	2					6	8	8
Avg.	1	2	2			2	2					2	1.6	1.6

Syllabus:

UNIT-1

Systems Analysis and Design: Meaning - System Analyst: Role and Responsibilities. Strategies of System Design and Development - Principles of System Development - Tools of System Development - Requirements Analysis: Strategies - Fact-finding – Feasibility Analysis - Documenting: DFD, DD, DT, Decision Trees,

UNIT-2

System Design: Objectives - Physical Vs. Logical Design- Areas of System Design: Input Design: Date Capture - GUI controls - prototype design - Process Design - Modeling Applications - Information Technology Architecture - Output Design - Principles - Prototype – Interface – Display – Forms Design.

UNIT-3

Procedure Design: Code Design – File Design – Methods – Storage Structures – Software Design – Techniques – Principles.

UNIT-4

System Testing: Types – Approaches – Quality Assurance – Assessing Reliability – Documentation – Training the users and operating personnel.

UNIT-5

System Implementation: Strategies and Techniques Conversion Methods – System support and maintenance system crash – Recovery- System Evaluation Techniques.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Whitten.L. Jeffery: Bentley. D. Lonnie: **"System Analysis and Design Methods"** Tata Mc. Graw Hill, New Delhi.
2. Senn. A.James: **"Analysis and Design of Information System"** Mc. Graw Hill, New York.
3. Davis. B. Gordeon, Olson, H.Margrethe: **"Management Information Systems"** Conceptual Foundations, Structure and Development, Mc.Graw Hill, New York.
4. Garg.K.Vinod, Srinivasan, S: **"Work book on Systems Analysis & Design"** Prentice Hall of India Pvt. Ltd., New Delhi.
5. Rajaraman, V. **"Analysis and Design of Information System"** Prentice Hall of India Pvt. Ltd., New Delhi.
6. Vigya Charya R. Bansal, **"Information System Analysis and Design"** A Modern Approach to System Development, New Age International Publishers, New Delhi.

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DEPARTMENT OF MASTER OF BUSINESS ADMINISTRATION

II MBA IV SEMESTER

Subject	Title	Contact Hrs		Marks			Credits
		L+T	P	I	E	T	
18E2298401	Logistic and Supply Chain Management	4		40	60	100	3
18E2298402	Entrepreneurship Development	4		40	60	100	3
HR							
18E2298511	Organizational Development & Change Management	4		40	60	100	3
18E2298512	Global HRM	4		40	60	100	3
18E2298513	Labor Welfare & Legislation	4		40	60	100	3
18E2298514	Management of Industrial Relations	4		40	60	100	3
FINANCE							
18E2298521	Financial Markets and Services	4		40	60	100	3
18E2298522	Global Financial Management	4		40	60	100	3
18E2298523	Risk Management	4		40	60	100	3
18E2298524	Tax Management	4		40	60	100	3
MARKETING							
18E2298531	Services Marketing	4		40	60	100	3
18E2298532	Promotional Distribution Management	4		40	60	100	3
18E2298533	Global Marketing Management	4		40	60	100	3
18E2298534	Supply Chain Management	4		40	60	100	3
SYSTEMS							
18E2298541	Business Intelligence	4		40	60	100	3
18E2298542	Enterprise Resource Planning	4		40	60	100	3
18E2298543	Cyber Laws & Security	4		40	60	100	3
18E2298544	Information Systems Audit	4		40	60	100	3
18E2298791	Major Project & Comprehensive Viva	....	....			Grade	8
TOTAL MARKS/CREDITS						2700	90

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II MBA IV SEMESTER

Sub Code: 18E2298401 Name of the Course: LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To explain the role of logistics and supply chain management in supplementing corporate strategy of a manufacturing organization.
2. To indentify the overall cost of logistic control process and evaluate various facets of logistic and supply chain management performance.
3. To apply various analytical methods and tools so that students are able to measure benchmark the logistics process and SCM operations by integrating and optimizing the total logistics and supply chain relationship
4. To focus on information business logistic systems this drives to improve accuracy in sourcing, transporting and pricing products.
5. To incorporate focus on the rate of change occurring in business today and more specifically in global business logistics.

Course Outcomes:

1. To identify the concepts of supply chain and Select the various drivers of supply chain performance in Logistics and Competitive strategy.
2. To classify logistics and supply chain management for identifying cost drivers and activity based costing.
3. To measure performance of logistic and supply chain management with a benchmark.
4. To improve inbound logistics and understand the fundamental role of logistic as it relates to transportation.
5. To apply knowledge to evaluate and manage an effective supply chain management at global level.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2								2		1	1
CO2	1	2		2								2	1	1
CO3	1	3		2									2	2
CO4	1	2		2						2			2	2
CO5	1				3					2		2	2	2
Total	5	7	2	6	3					4	2	4	8	8

Average	1	2.3	2	2	3					2	2	2	1.6	1.6

Syllabus:

UNIT 1

Logistics and Competitive strategy: Competitive advantage – Gaining Competitive advantage through logistics-Integrated supply chains– Competitive performance - Models in Logistics Management - Logistics to Supply Chain Management – Focus areas in Supply Chain Management.- Customer service and retention- Basic service capability Value added services

UNIT 2

Measuring logistics costs and performance: The concept of Total Cost analysis – Principles of logistics costing – Logistics and the bottom-line – Impact of Logistics on shareholder value - customer profitability analysis –direct product profitability – cost drivers and activity-based costing.

UNIT 3

Logistics and Supply chain relationships: Benchmarking the logistics process and SCM operations –Mapping the supply chain processes – Supplier and distributor benchmarking – setting benchmarking priorities –identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics service alliances.

UNIT 4

Sourcing, Transporting and Pricing Products: sourcing decisions and transportation in supply chain – infrastructure suppliers of transport services – transportation economics and pricing – documentation - pricing and revenue management Lack of coordination and Bullwhip Effect - Impact of lack of coordination. - CRM –Internal supply chain management - .

UNIT 5

Managing global Logistic: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy – Global strategy –Global purchasing – Global logistics – Channels in Global logistics –Global alliances.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Donald J.Bowersox and David J.Closs: "Logistical Management" The Integrated Supply Chain Process, TMH, 2011.
2. Edward J Bradi, John J Coyle: " A Logistics Approch to Supply Chain Management, Cengage Learning, New Delhi, 2012.
3. K.Agrawal: "Distribution and Logistics Management", MacMillan Publishers, 2011
4. Sunil Chopra and Peter Meindl: "Supply chain Management: Strategy, Planning and Operation", Pearson Education, New Delhi 2013
5. Rahul V Altekar: Supply Chain Management, PHI Learning Ltd, New Delhi, 2009

Sub Code: 18E2298402 Name of the Course: ENTREPRENEURSHIP DEVELOPMENT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the role and importance of entrepreneurship for economic development and women entrepreneurship.
2. Students will be able to develop the ability of analysing various aspects of entrepreneurship through training.
3. To understand the concepts of project management for planning to execute the project, feasibility analysis.
4. To consider the legal and financial conditions for starting a business venture, evaluate the effectiveness of different entrepreneurial strategies and challenges.
5. To expand students thought process by imparting him about supportive role government, ED institutions. Giving glimpse on MSME, WOMEN role, basic Requirements for entrepreneurs

Course outcomes:

1. To evaluate the role and importance of entrepreneurship for economic development, develop personal creativity and women entrepreneur initiative.
2. To acquire necessary knowledge and skills required for organising and carrying out entrepreneur activities through training by adopting the key steps in the elaboration of business ideas.
3. To make them capable to analyse, apply and appreciate contemporary project management tools and methodologies.
4. To learn policies and their support to MSMEs for growth strategies and its challenges in International business
5. To understand about supportive role of government, financial institutions and educational institution offering ED programmes.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2			2	2		2				1	1
CO2	1		2		2				2				1	1
CO3	1	2			2						3		2	2
CO4	1					2	2					2	2	2

CO5	1					2	2	2				2	2	2
Total	5	2	4		4	6	6	2	4		3	4	8	8
Average	1	2	2		2	3	3	1	2		1	2	1.6	1.6

Syllabus:

UNIT 1

Entrepreneurship: Importance and growth - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship, Ethics and Social Responsibilities. Women Entrepreneurship: Role & Importance, Problems of Women Entrepreneurs – corporate entrepreneurship – mobility of entrepreneur – entrepreneurial motivation.

UNIT 2

Training: Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit - Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes

UNIT 3

Planning and Evaluation of Projects: Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study - Post Planning of Project-Project Planning and Control.

UNIT 4

Small and Micro Enterprises: Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies – small entrepreneurs in International business.

UNIT 5

Institutional Support to Entrepreneur and MSMEs: Role of Government - Role of IDBI, NIESBUD, SISI, DIC - Financial Institutions-Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programme.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko: "Entrepreneurship', Cengage Learning, New Delhi,
3. K.Ramachandran: "Entrepreneurship Development", TMH, New Delhi, 2012 4.B.Janakiram, M Rizwana: "Entrepreneurship Development" Excel Books, New Delhi, 2011 5.Rajeev Roy: "Entrepreneurship", Oxford University Press, New Delhi,2012
6. P.C.Shejwalkar: "Entrepreneurship Development", Everest Publishing House, New Delhi, 2011

HR ELECTIVE 5

Sub Code: 18E22985. **Name of the Course:** **ORGANIZATIONAL DEVELOPMENT & CHANGE MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To give abroad theoretical and practical understanding of key concepts and issues in managing organising change.
2. To give an idea and awareness about mapping change models.
3. To identify major types of organizational development interventions.
4. To explain collective bargaining as an exchange and economic relationship.
5. To improve team communication effectiveness.

Course Outcomes:

1. To be ready for the types of change and value based change.
2. To know various change mapping models to face the challenges.
3. To identify the key roles and responsibilities of an organisational development consultant needed to develop and sustain long term organisational development interventions.
4. To understand the importance of collective bargaining as an exchange and economic relationship.
5. To communicate, plan and resolve conflicts in team building.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1			2		2	2		2	2			1	1
CO2	1	2	2	2					2	2			1	1
CO3	1					2	2					2	2	2
CO4	1					2			2				2	2
CO5	1								2	3		2	2	2
Total	5	2	2	4		6	4		8	7		4	8	8
Average	1	2	2	2		2	2		2	2.3		2	1.6	1.6

Syllabus:

UNIT 1

Basics of Change Management: Meaning, nature and Types of Change – change programmes – change levers – change as transformation – change as turnaround – value based change.

UNIT 2

Mapping change: The role of diagramming in system investigation – A review of basic flow diagramming techniques –systems relationships – systems diagramming and mapping, influence charts, multiple cause diagrams- a multidisciplinary approach -Systems approach to change: systems autonomy and behavior – the intervention strategy model – total project management model (TPMM). Learning organization: The relevance of a learning organization - strategies to build a learning organization

UNIT 3

Organization Development (OD): Meaning, Nature and scope of OD - Dynamics of planned change – Person-focused and role-focused OD interventions –Planning OD Strategy – OD interventions in Indian Organizations – Challenges to OD Practioners

UNIT 4

Negotiated Change: Change in the labour - management relations in the post-liberalized India – collective bargaining strategy to the challenges of Globalization and the restructuring of enterprises in India - Changes in the legal frame work of collective bargaining - Negotiated flexibility, productivity bargaining, improved work relations, public sector bargaining and social security.

UNIT 5

Team Building: Nature and Importance of Teams – Team Vs Groups – Types of teams – Characteristics of Virtual teams – Team building life cycle – Team building skills – Virtual team - High performance teams – self managing teams – Building team relationships – empowered teams – leadership on teams – Managing cross –cultural diversity in teams – Group think as a decision making process – effective decision making techniques for teams and groups – role of change consultant— contemporary issues in managing teams.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Cummings: "Theory of Organisation Development and Change", Cengage Learning, New Delhi, 2013.
2. Robert A Paton: Change Management, Sage Publications, New Delhi, 2011.
3. NilanjanSengupta: Managing Changing Organisations, PHI Learning, New Delhi, 2009
4. Adrian Thornhill: Managing Change, Pearson Education, New Delhi, 2012.
5. Radha R Sharma: Change Management, TMH, New Delhi, 2012

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HR ELECTIVE-6

Sub Code: **18E2298512** Name of the Course: **Global HRM**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Couse objectives:

1. The objective of this course is to enable the students with basic concepts and practices of Global Human Resource Management.
2. To create awareness about selection methods and International assignments for Women.
3. To learn common and important patterned social and cross culture management.
4. To give an idea about Compensation Management and Performance Management.
5. To help the student to focus on the Measures for creating global HRD Climate, challenges in creation of new jobs through Globalization

Course outcomes:

1. To evaluate the developing role of human resources in the global arena.
2. To design and formulate various selection methods and International assignments for Women.
3. To understand different skill building methods and experience cross cultural communication.
4. To design a performance appraisal, reward system, pay plans and incentives at global level
5. To analyse the strategic issues in measures for creating global HRD Climate, challenges in creation of new jobs through Globalization

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2		2							1	1
CO2	1		3			2	2					2	1	1
CO3	1								2	3			2	2
CO4	1		2			2	2						2	2
CO5	1	2	2			2	2					2	2	2
Total	5	4	7	2		8	6		2	3		4	8	8
Average	1	2	2.3	1		2	2		2	3		2	1.6	1.6

Syllabus:

UNIT 1

Introduction: A Global HR Perspective in New Economy-Challenges of Globalization - Implications of Managing People and Leveraging Human Resource- - Conflicts - Strategic Role of International HRM – Global HR Planning – Staffing policy – Training and development – performance appraisal –International Labour relations – Industrial democracy – Talent crunch – Indian MNCs and Challenges - Legal content of Global HRM.

UNIT 2

Managing International Assignments: Significance – Selection methods - Positioning Expatriate – Repatriate – factors of consideration - Strategies - International assignments for Women - Problems.

UNIT 3

Cross Culture Management: Importance – Concepts and issues – theories- considerations - Problems – Skill building methods – Cross Culture Communication and Negotiation – Cross Culture Teams.

UNIT 4

Compensation Management: Importance – Concepts- Trends - Issues – Methods – Factors of Consideration – Models – incentive methods – global compensation implications on Indian systems - Performance Management.

UNIT 5

Global Strategic Advantages through HRD: Measures for creating global HRD Climate – Strategic Frame Work of HRD and Challenges - Globalization and Quality of Working Life and Productivity – Challenges in Creation of New Jobs through Globalization- New Corporate Culture

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Subba Rao P: "International Human Resource Management", Himalaya Publishing House, Hyderabad, 2011
2. NilanjanSen Gupta: "International Human Resource Management Text and cases" Excel Books, New Delhi.
3. Tony Edwards :"International Human Resource Management", Pearson Education, New Delhi, 2012
4. Aswathappa K, Sadhana Dash: "International Human Resource Management, TMH, New Delhi,
5. Monir H Tayeb: "International Human Resource Management", Oxford Universities Press, Hyderabad, 2012.

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HR ELECTIVE 7

Sub Code: 18E2298513 **Name of the Course: LABOR WELFARE & LEGISLATION**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To know the development and the judicial setup of Welfare Legislation.
2. To learn the laws relating to Industrial Relations Legislation, Social Security and Working conditions.
3. To learn the salient features of wage and social security legislation.
4. To create awareness about Indian constitution on labour and labour problems
5. To create awareness about the statutory and non statutory benefits like education ,work environment welfare centers etc..

Course Outcomes:

1. To understand the statutory and non statutory benefits in Factories Act 1948.
2. To understand laws related to Industrial Relations, Social Security and Working conditions.
3. To apply wage, social security legislation for the benefits of employees.
4. To understand labour problems related to indebtness, absenteeism etc.
5. To understand the statutory and non statutory benefits like education, work environment welfare centres etc.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2	2					1	1
CO2	1	2				2	2					3	1	1
CO3	1	2		2		2			2			2	2	2
CO4	1	2							2	2			2	2
CO5	1	2		2		2						2	2	2
Total	5	8		4		8	4	2	4	2		7	8	8

Syllabus:

UNIT 1

Welfare Legislation: Factories Act 1948, Mines Act 1952, Plantation Labour Act 1951, Contract Labour (Regulation and Abolition) Act 1970 and A.P.Shops and Establishments Act.

UNIT 2

Industrial Relations Legislation: Industrial Disputes Act 1947; Industrial Employment (standing orders) Act 1946 and Trade Unions Act 1926.

UNIT 3

Wage and Social Security Legislation: Payment of wages Act 1936 - Minimum wages Act 1948 - Payment of Bonus Act 1966 -. Payment of Gratuity Act 1972 - Workmen's Compensation Act 1923 - Employees State Insurance Act 1948 - Maternity Benefit Act 1961 and Employees Provident Fund and Miscellaneous Provisions Act 1952.

UNIT 4

Labour Welfare: Concept, scope and philosophy, principles of labour welfare, Indian constitution on labour, Agencies of labour welfare and their role. Impact of ILO on labour welfare in India. Labour problems – Indebtedness, Absenteeism, Alcoholism, Personal and Family Counselling.

UNIT 5

Labour welfare programmes: Statutory and non-statutory, extra mural and intra mural, Central Board of Workers' Education; Workers' Cooperatives; Welfare Centers, Welfare Officers' Role, Status and Functions. Role of social work in industry.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Govt. of India (Ministry of Labour, 1969). Report of the Commission on Labour Welfare, New Delhi: Author.
2. Govt. of India (Ministry of Labour, 1983). Report on Royal Commission on Labour in India, New Delhi: Author.
3. Malik, P.L: "Industrial Law", Eastern Book Company. Laknow,1977
5. Moorthy, M.V: "Principles of Labour Welfare", Oxford University Press, New Delhi.
6. Pant, S.C: "Indian Labour Problems", Chaitanya Pub. House. Allahabad.

HR ELECTIVE 8

Sub Code: 18E2298514 **Name of the Course: MANAGEMENT OF INDUSTRIAL RELATIONS**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. The objective of the course is to impart to the skills necessary for maintaining harmonious relations in the organizations.
2. To create awareness of trade unions and problems of workers.
3. To learn about the importance of quality of work life through worker's participation in collective bargaining and issues related to wage determination.
4. To learn about various social security acts like Workmen Compensation Act, Employee State Insurance Act etc.
5. To create awareness with grievance handling and settlement of industrial disputes in the organisation.

Course outcomes:

1. To understand the importance of employer –employee relationship in the organisation and Influencing factors of IR in enterprise and the consequences.
2. To be acquainted with the concepts, principles and issues connected with trade unions
3. To understand the importance of quality of work life through worker's participation in collective bargaining and issues related to wage determination.
4. To acquainted with various social security acts like Workmen Compensation Act, Employee State Insurance Act etc.
5. To well versed with grievance handling and settlement of industrial disputes in the organisation.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2				2			2				1	1
CO2	1		2					3					1	1
CO3	1		2	2	2				2			2	2	2
CO4	1	2		2			2					2	2	2
CO5	1	2	2	2						2		2	2	2
Total	5	6	6	6	2	2	2	3	4	2		6	8	8
Average	1	2	2	2	2	2	2	3	2	2		2	1.6	1.6

Syllabus:

UNIT 1

Industrial Relations Management: Concept- Evaluation –Background of industrial Relations in India- Influencing factors of IR in enterprise and the consequences. Economic, Social and Political environments- Employment Structure –Social Partnership-Wider approaches to industrial relations- Labour Market.

UNIT 2

Trade Unions: Introduction-Definition and objectives-growth of Trade Unions in India-trade Unions Act , 1926 and Legal framework-Union recognition-Union Problems-Employees Association-introduction ,Objective Membership, Financial Status.

UNIT 3

Quality of Work Life: Workers' Participation in Management - Worker's Participation in India, shop floor, Plant Level, Board Level- Workers' Welfare in Indian scenario- Collective bargaining concepts & Characteristics –Promoting peace.Wage and Salary administration: Nature & Significance of wage, salary administration, essentials- Minimum wage- Fair wage, Real wage, Incentives & fringe benefits. Issues and Constraints in Wage Determination in India.

UNIT 4

Social Security: Introduction and types –Social Security in India, Health and Occupational safety programs- Salient features of Workmen Compensation Act and Employees' State Insurance Act relating to social security – Workers' education objectives -Rewarding.

UNIT 5

Employee Grievances: Causes of Grievances –Conciliation, Arbitration and Adjudication procedural aspects for Settlement of Grievances –Standing Orders- Code Discipline. Industrial Disputes: Meaning, nature and scope of industrial disputes - Cases and Consequences of Industrial Disputes –Prevention and Settlement of industrial disputes in India.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. C.S Venkataratnam: "**Industrial Relations**", Oxford University Press, New Delhi, 2011
2. Sinha: "**Industrial Relations, Trade Unions and Labour Legislation**", Pearson Education, New Delhi, 2013
3. Mamoria: "**Dynamics of Industrial Relations**", Himalaya Publishing House, New Delhi, 2010
4. B.D.Singh: "**Industrial Relations**" Excel Books, New Delhi, 2010
5. Arun Monappa: "**Industrial Relations**", TMH, New Delhi. 2012
6. Prof. N.Sambasiva Rao and Dr. Nirmal Kumar: "**Human Resource Management and Industrial Relations**", Himalaya Publishing House, Mumbai
7. Ratna Sen: "**Industrial Relations**", MacMillon Publishers, New Delhi, 2011

FINANCE ELECTIVE 5

Sub Code: 18E2298521 **Name of the Course:** FINANCIAL MARKETS AND SERVICES

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To create an awareness about the role and function of the financial system and Financial Markets.
2. To create an awareness of the current structure and regulation of the Indian financial services sector.
3. To learn about the legal aspects guidelines, financing pattern under venture capital and concepts of leasing.
4. To understand the concepts of credit analysis and scoring.
5. To be aware of basic concepts of mutual fund, types and working of mutual fund industry

Course outcomes:

1. To understand the role and function of the financial system and SEBI.
2. To demonstrate an awareness of the current structure and regulation of the Indian financial services sector.
3. To able to understand the legal aspects guidelines, financing pattern under venture capital and leasing
4. To conversant with credit rating practices of specialised rating agencies.
5. To Acquire tools to analyse the performance of mutual funds.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2	2					2	1	1
CO2	1	2		2		2						2	1	1
CO3	1		2	2			2	2					2	2
CO4	1			2			2					2	2	2
CO5	1				3							2	2	2
Total	5	2	2	6	3	4	6	2				8	8	8
Average	1	2	2	2	3	2	3	2				2	1.6	1.6

Syllabus:

UNIT 1

Structure of Financial System: Role of Financial System in Economic Development – Financial Markets and Financial Instruments – Capital Markets – Money Markets – Primary Market Operations – Role of SEBI – Secondary Market Operations – Regulation – Functions of Stock Exchanges – Listing – Formalities – Financial Services Sector Problems and Reforms.

UNIT 2

Financial Services: Concept, Nature and Scope of Financial Services – Regulatory Frame Work of Financial Services – Growth of Financial Services in India – Merchant Banking – Meaning-Types – Responsibilities of Merchant Bankers – Role of Merchant Bankers in Issue Management – Regulation of Merchant Banking in India.

UNIT 3

Venture Capital: Growth of Venture Capital in India – Financing Pattern under Venture Capital – Legal Aspects and Guidelines for Venture Capital, Leasing – types of Leases – Evaluation of Leasing Option Vs. Borrowing.

UNIT 4

Credit Rating: Meaning, Functions – Debt Rating System of CRISIL, ICRA and CARE. Factoring, Forfeiting and Bill Discounting – Types of Factoring Arrangements – Factoring in the Indian Context;

UNIT 5

Mutual Funds: Concept and Objectives, Functions and Portfolio Classification, Organization and Mangement, Guidelines for Mutual Funds, Working of Public and Private Mutual Funds in India. Debt Securitisation – Concept and Application – De-mat Services-need and Operations-role of NSDL and CSDL.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Bhole & Mahakud, Financial Institutions and Market, TMH, New Delhi
2. DK Murthy, and Venugopal, Indian Financial System, IK Int Pub House
3. Anthony Saunders and MM Cornett, Fin Markets & Institutions,TMH, ND
4 Edminister R.D., Financial Institution, Markets and Management:
5. Punithavathy Pandian, Financial Markets and Services, Vikas, New Delhi
6. Vasanth Desai, Financial Markets & Financial Services, Himalaya, Mumbai

FINANCE ELECTIVE 6

Sub Code: 18E2298522	**Name of the Course:** GLOBAL FINANCIAL MANAGEMENT		
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To create awareness about conceptual framework in Globalization and MNCs , International Monitory Reforms.
2. To identify management of opportunities and risk relating international investments, exchange rate fluctuations.
3. To acquire knowledge of how forward contacts, futures, swaps and options work.
4. To provide student with thorough understanding of capital budgeting and international investment.
5. To understand the problem of global indebtness and factors influencing debt crises.

Course outcomes:

1. To know how to manage multinational company's investment and International Monitory Reforms.
2. To identify risk relating to exchange rate fluctuation and develop strategies to deal with them.
3. To apply advanced techniques for pricing derivates such as Market for Currency Futures and Currency Options.
4. To discuss various aspects of international financial management including the operations of currency markets, capital budgeting and international investment.
5. To analyse the magnitude of external debt, debt crisis and internal financing by MNC's

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2					2					1	1
CO2	1					2	2					2	1	1
CO3	1	2			2							2	2	2
CO4	1		2								2		2	2
CO5	1			2				2				2	2	2
Total	5	4	4	2	2	2	2	4			2	6	8	8
Average	1	2	2	2	2	2	2	2			2	2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Global Financial Management: Globalization and MNCs- Global Winds of Change- New Challenges and Opportunities- Importance of Global Factors- Regulatory and Legal Frame Work- Global Organizational Restructuring- International Monitory System- Exchange Rates and Par Values- International Monitory Reforms- Special Drawing Rights (SDR) –SDR Allocation.

UNIT 2

Management of Exchange and Interest Rates Exposure: Determination of Exchange Rates- Balance of Payments (Equilibrium vs Disequilibrium)- International Trade Flow- Time factor in International Risks- Hedging in Swap Market- Measurement of Politico Economics Risk- Management of International Transactions Exposure.

UNIT 3

Management of Global Business Operations and Practices: Operational Strategies of MNCs- Management of Global Business Practices- Sources of funds for MNCs- Operations in International Financial Markets- Inter-Corporate Funds Flow- Market for Currency Futures and Currency Options.

UNIT 4

International Investment Decision : Foreign Direct Investment- International Capital Budgeting- Evaluation and Management of Political Risk- Global Portfolio Investment- International Global Financial Decisions- Role of Multi Lateral Development Banks- Global Financial Market Instruments- Management of Interest Rate Risk- Shorter Asset and Liability Management.

UNIT 5

Global Indebtedness: External Resources and Development- Nature and Magnitudes of External Debt- Factors influencing Debt Crisis- Management of external Indebtedness and Challenges- Short -Term Financing- Internal Financing by MNCs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Jeff Madura, " International Financial Management" Cengage Learning Limited, 2008.
2. PG Apte, "International Financial Management" Tata McGraw Hill Limited, 2009.
3. Vyuptakesh Sharan, "International Financial Management" PHI, 2012.
4. V.A. Avadhani, "International Financial Management" Himalaya Publishing House, 2009

FINANCE ELECTIVE 7

Sub Code: 18E2298523		**Name of the Course:** RISK MANAGEMENT	
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the role of financial institutions and risk management frame work.
2. To understand the variety of techniques to identify, assess , manage and monitor the risk .
3. To provide a framework and process for the management of risk.
4. To create awareness on the regulatory framework of risk management.
5. To learn important concepts of risk management like black scholes model ,Moody's KMV portfolio manager and derivative products.

Course Outcomes:

1. To Identify and categorise the various risks face by an organisation.
2. To analyse various techniques of measuring the risks.
3. To know the overall management of risk tools.
4. To get Awareness of revised RBI risk management norms, BASEL committee and calculations of minimum capital requirements.
5. To apply the concepts like time value of money, black scholes model, Moody's KMV portfolio manager and derivative products in risk management.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2								2	1	1
CO2	1	2			2						2		1	1
CO3	1					2					2		2	2
CO4	1		2	2								2	2	2
CO5	1	2	2	2	2						3		2	2
Total	5	6	4	6	4	2					7	4	8	8
Average	1	2	2	2	2	2					2.3	2	1.6	1.6

Syllabus:

UNIT1

Introduction to Risk Management: Role of Financial Institutions- Future Trends and Global Issues- Financial Services provided by Intermediaries- Need of Risk Management- What is Risk- Sources of various Risk- Risk Management frame work in Organization- Identification of Risks like Liquidity Risk, Market Risk, Foreign Exchange Risk, Operational Risk etc.

UNIT 2

Measurement of Risks: Measurement of Interest Rate Risk and Market Rate Risk- Measurement of Credit Risk- Measurement of operational and Technology Risk- Measurement of Foreign Exchange and Sovereign Risk- Measurement of Liquidity Risk- Measurement of Off Balance Sheet Risks.

UNIT3

Management of Risks: Risk Management Tools- Interest Rate Risk Management- Market Risk Management- Credit Risk Management- Operational Risk Management- Foreign Exchange and Sovereign Risk Management- Liquidity Risk Management- Management of Capital Adequacy- Risk Reporting

UNIT 4

Regulatory and Other Issues in Risk Management: Regulatory Frame Work- Revised RBI Risk Management Norms to Banks- Organizational Structure for Market and Credit Risk- SEBI, NHB- Bank for International Settlement- BASEL Committee on Banking Supervision- BASEL Settlement I,II & III- Calculation of Minimum Capital Requirements.

UNIT 5

Important Concepts of Risk Management: Time Value of Money- Advance Bond Concepts- Calculation of VaR- Balck-Scholes Model- Moody's KMV Portfolio Manager- Probability Distribution and Fundamentals of Statistics- Derivative Products and its Markets- Margin and Mark-to-Market.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. G. Kotreshwar: "Risk Management", Himalaya Publishing House, Delhi. 2012
2. Trieschmann, Hoyt, Sommer: "Risk Management and Insurance", Cengage Learning. 2005,
3. Dhanesh Kumar Khatri: "Derivatives and Risk Management", Mac Millan, 2012
4. Vivek, P.N. Asthana:"Financial Risk Management", Himalaya Publishing House, Delhi. 2012
5. Rene M. Stulz. "Risk Management & Derivatives" Cengage Learning. 2003.

FINANCE ELECTIVE 8

Sub Code: 18E2298524		**Name of the Course:** TAX MANAGEMENT	
Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the concept of tax and different heads of incomes.
2. To familiarize with the concepts of GST.
3. To understand the framework of tax planning
4. To apply tax management decisions
5. To learn the concept of Multi National Taxation.

Course outcomes:

1. To identify the different types of tax and heads of incomes.
2. To understand the concepts of GST
3. To analyze the essential components in levy of tax, Five basic Rules of interpretation of statues, Tax Planning and Tax Management.
4. To apply management decisions, such as make / buy- own/lease, export/local sale and Guidelines to Tax planning.
5. To apply the concepts Bilateral Tax Treaties, Transfer Pricing for Tax Planning and Global Investment and Tax Incentives

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1							2			2	2	1	1
CO2	1		2	2		2						2	1	1
CO3	1	2		2				2			2	2	2	2
CO4	1	2	2	2		2		2				2	2	2
CO5	1	2		2		2		2				2	2	2
Total	5	6	4	8		6		8			4	10	8	8
Average	1	2	2	2		2		2			2	2	1.6	1.6

Syllabus:

UNIT 1

Direct Tax: Basic concepts– Residential Status– Income from Salary- Income from House Property– Income from Business and Profession- Income from Capital Gains- Income from other sources – computation of Total Income—Exemptions.

UNIT 2

Indirect Tax: Introduction to Goods and Service Tax (GST) - Key Concepts, Phases of GST, GST Council, rate slabs under GST, Cess , Registration under GST, Filing of returns under GST

UNIT 3

Introduction to Tax Planning: Nature of Tax – Essential components in levy of tax – Legal Principles of taxation laws – Five basic Rules of interpretation of statues – Law Lexicon and Legal Maxims – Concepts of Tax Avoidance, Tax Evasion – Tax Planning and Tax Management.

UNIT 4

Tax Management Decisions: Tax considerations - Management Decisions, such as make / buy-own/lease - export/local sale - Guidelines to Tax planning – Relief's – Concessions – Rebates – Deductions – Incentives (Payment of Advance Tax) – Filing of Returns – Refunds – Penalties for non-compliance.

UNIT 5

Multi National Taxation: Bilateral Tax Treaties- Transfer Pricing for Tax Planning – Uses of Inter Company Loans- Tax Intensives Organizational Setup of MNCs- Tax Reliefs and Rebates in India- Tax Credits- Tax Havens- Investment Decision on Tax Planning- Global Investment and Tax Incentives- Transfer Pricing Methods- Measures to Plug Tax Loopholes.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Vinod K.Singhania and Mounica singhnia, Corporate Tax Planning and business Management, Taxmann Publications.
2. Vinod K.Singhania and Kapil Singhania, Direct Taxes – Law and Practice, Taxmann Publications
3. R.N.Lakhotia, Corporate Tax Planning, vision publications.
4. V.A. Avadhani, "International Financial Managment" Himalaya Publishing House, 2009
5. PG Apte, "International Financial Management" Tata Mc Graw Hill, 2009

MARKETING ELECTIVE 5

Sub Code: 18E2298531 **Name of the Course SERVICES MARKETING**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To develop an understanding of the roles of services marketing, building services aspirations and tracking customer behaviour.
2. To appraise the nature of service environment and customer satisfaction measurement Techniques.
3. To demonstrate the knowledge of the extended marketing mix for services, creating and maintaining value relationship, market leadership strategies.
4. To appraise the way in which this theory can be practically applied in various service sector .
5. To appraise the way in which this theory can be practically applies in various sectors like health care ,entertainment ,retail shopping malls etc.

Course Outcomes:

1. To identify and understand the roles of services marketing, building services aspirations and tracking customer behaviour.
2. To know the nature of service environment and customer satisfaction measurement Techniques.
3. To analyse the extended marketing mix for services, creating and maintaining value relationship, market leadership strategies.
4. To apply the way in which this theory can be practically applied in various service sector .
5. To apply the way in which this theory can be practically applies in various sectors like health care ,entertainment ,retail shopping malls etc.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2									1	1
CO2	1		2									2	1	1
CO3	1	2		2		2			2				2	2
CO4	1			2			2				3		2	2
CO5	1	2		2				2					2	2
Total	5	6	2	8		2	2	2	2		3	2	8	8

Average	1	2	2	2		2	2	2	2		1.6	2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Services Marketing: Scope and Definition- Services Marketing Environment- Definition- Goods and Services- Components of Service- Characteristics- Service Delivery as a System- Service Facility Design and Layout- HRM Issues- -Building Services Aspirations- Tracking Customer Behavior-.

UNIT 2

Key Dimensions of Services Marketing: Introduction- Service Environment- Service Blue Printing- Service Encounter- Customer Expectations- Demand- Supply Management- Service Quality- Service Quality Gap- Service Quality Audit-Delivering Quality Services- Communication Strategies- Bench Marking-TQM-Customer Satisfaction Measurement Techniques- MPQ-ROQ- Service Guarantees.

UNIT 3

Management of Services Marketing: Introduction- Marketing Mix- Developing a Package- Product Attractiveness- Components of Promotion Mix- Strategic Services Marketing- Service Target Segments- Positioning the Services- Creating and Maintaining Value Relationship- Market Leadership Strategies.

UNIT 4

Service Marketing Practices I: Marketing of Financial and Insurance Services- Major Characteristics- Technological Innovations- Regulatory Mechanism- Marketing of Hospitality, Travel and Tourism Products- Marketing for Travel and Tourism- Segmentation- Tourism Marketing Strategies- Yield Management- Services Delivery- Global Service Quality- Marketing of Educational, Software and other Professional Services.

UNIT 5

Service Marketing Practices II: Marketing of Health Care, Celluar and Entertainment Services- Health Care Marketing Strategy- Major Hospital Products- Cellular Promotion Mix- Entertainment Marketing Mix- Emerging Influence of Retailing and Shopping Malls- Internationalization of Services- Liberization of Services- Off shoring – ITES- Industry Structure- Business Models

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Dr. S. Shajahan: Services Marketing, Himalaya Publishing House, New Delhi 2009.
2. Rajendra Nargundkar: "Services Marketing", Tata McGraw Hill, New Delhi, 2011.
3. S.M. Jha: Service Management and Marketing, Himalaya Publishing House, New Delhi,2011
4. C. Bhattacharjee: Services Marketing, Excel Books, New Delhi, 2010

MARKETING ELECTIVE 6

Sub Code: 18E2298532 **Name of the Course: PROMOTION AND DISTRIBUTION MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To facilitate and understand the connections between Sales Promotion and Consumer Behaviour
2. To learn the concepts of physical distribution management and strategic issues in physical distribution.
3. To develop knowledge about the structure and function of marketing channels.
4. To implement and manage major institutional forms of marketing channels.
5. To analyse the interaction of marketing and environmental forces through an understanding of marketing decisions and practices ethically

Course Outcomes:

1. To understand the connections between Sales Promotion and Consumer Behaviour.
2. To apply the concepts of total distribution costs and cost trade-offs and physical distribution to marketing logistics.
3. To develop an understanding of how marketing channel strategy affects and is affected by the other strategic components of the marketing mix.
4. To describe and analyse the major institutional channels forms.
5. To make decisions ethically and face challenges in managing an International Distribution Strategy.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2				2							1	1
CO2	1		2	2		2	2				2		1	1
CO3	1			2		2						2	2	2
CO4	1	2	2				2					2	2	2
CO5	1		2	2			2	2			2	2	2	2
Total	5	4	6	6		6	6	2			4	6	8	8
Average	1	2	2	2		2	2	2			2	2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Promotional Management: Sales Display and Sales Promotion- Sales Promotion Objectives- Types of Sales Displays- Factors Influencing Sales Promotion- Tools of Sales Promotion- Sales Promotion Strategies- Sales Promotion and Consumer Behavior- Consumers Price Perceptions- Perceived Risk and Attitudes- Types of Promotion.

UNIT 2

Introduction to Distribution Management: Physical Distribution Management- The Concepts of Total Distribution Costs and Cost Trade-offs- Customer Service Standards- Strategic Issues in Physical Distribution- Challenges and Opportunities- From Physical Distribution to Marketing Logistics- Major Logistics Functions

UNIT 3

Marketing Channels: Nature and Importance of Marketing Channels- Emergence of Marketing Channel Structures- Types of Marketing Channels- Direct Marketing Channels vs Indirect Marketing Channels- Problems in Distribution- Selection of Distribution Channels- Channel Decisions

UNIT 4

Channel Institutions and Designing Channel System: Wholesaling- Agent Wholesaling Middle Man- Patterns in Wholesaling- Wholesaler Marketing Decision- Changing Patterns- Channel Design Decisions- Channel Design Comparison Factors- Ideal Channel Structure- Types of Channels- Implementation and Integration of Channel Design.

UNIT 5

Ethical and Social Issues in Distribution Management: Business Ethics and Sales Management- Ethical Issues facing Sales Managers- Managing Sales Ethics- Modeling Ethical Behavior- Making Decisions on Ethical Problems- Building a Sales Ethics Programme- International Distribution- Challenges in Managing an International Distribution Strategy.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. K. Shridhara Bhat: "**Sales and Distribution Management**", Himalaya Publishing House, 2011.
2. Dr. Matin Khan: "**Sales and Distribution Management**", Excel Books, New Delhi, 2005.
3. Pingali Venugopal: "**Sales and Distribution Managment**", Sage Publications, New Delhi,2008.
4. Dr. S. L. Gupta: "**Sales and Distribution Management**", Excel Books, 2010

MARKETING ELECTIVE 7

Sub Code: 18E2298533 **Name of the Course: GLOBAL MARKETING MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course Objectives:

1. To learn about growing importance of global marketing management.
2. To enable the students to understand the marketing elements, strategies for FDI and FIIs and entry strategies of Indian Firms.
3. To understand the market opportunity for a new product or new services in terms of its potential users.
4. To develop knowledge about the structure and function of global marketing channels.
5. To learn the export procedures like licencing, shipping ,procurement of goods inspection documents related to shipment.

Course outcomes:

1. To understand the concepts of global marketing management, stages of internationalization and driving forces of global markets.
2. To enable the students to apply the marketing elements , strategies for FDI and FIIs and entry strategies of Indian Firms.
3. To apply how to asses new product and new service development opportunities.
4. To develop an understanding of how global marketing channel strategy affects and is affected by the other strategic components of the marketing mix.
5. To get awareness about the documents required for export procedures.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		2		2							1	1
CO2	1		2			2	2					2	1	1
CO3	1	2	2								2		2	2
CO4	1		2	2		2						2	2	2
CO5	1			2			2						2	2
Total	5	4	6	6		6	4				2	4	8	8
Average	1	2	2	2		2	2				2	2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Global Marketing: Scope and Significance of global Marketing, - Difference between global and domestic marketing – The growing attractiveness of developing country market – International orientations, Stages of internationalization, Driving and restraining forces of global markets, Participants in international marketing.

UNIT 2:

International marketing strategy: Entry strategies in Global markets – modes of entries in global markets – global market segmentation – international targeting – criteria for targeting, selecting a global target market – Global product positioning strategy. Business Customs in global Market – strategies for FDI and FIIs - Entry Strategies of Indian Firms

UNIT 3:

Global Product & Price management: International product mix – Managing Global Research and Development for product management– Product diffusion and adoption in global markets – International Product Life Cycle – Product and culture – Global brand leadership–: Environmental influences on Pricing Decisions – Grey Market goods – Transfer pricing – Global Pricing – Policy Alternatives – Constraints on global pricing

UNIT 4:

Global Marketing Channels and Promotion for global markets: channels – Innovations in global channels – Channel strategy for new market entry – Distribution Structures – Global Distribution Patterns - Challenges in Managing An Global Distribution Strategy – Selecting Foreign Country Market intermediaries - Global Advertising and branding - Export Policy Decisions of a firm - Export costing and pricing – EXIM policy of India.

UNIT 5:

Export procedures and documents: Preliminaries: inquiry and offer – confirmation of offer – export license – finance – production /procurement of goods – shipping space – packing and marketing – quality control and pre – shipment inspection – excise clearance – customs formalities – negotiation and documents – standardization and aligned pre-shipment documents – documents related to goods – documents related to shipments.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Francis Cherunilam: International marketing, 11th Edition, Himalaya Publication House,2010
2. Warren J Keegan: Global Marketing Management, 5th Edition, Prentice Hall of India Private Limited.
3. Philip R. Cateora, John L. Graham: International Marketing 11/e, Tata McGraw-Hill Co. Ltd., 2002.
4. R.Srinivasan: International Marketing, Prentice-Hall of India Pvt. Ltd., 2010
5. U.C Mathur: International Marketing Management, Sage Publications, New Delhi 2008
6. Kotabe, Peloso: International Marketing, Wiley India, New Delhi, 2020

MARKETING ELECTIVE 8

Sub Code: 18E2298534 **Name of the Course: SUPPLY CHAIN MANAGEMENT**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To familiar with the term supply chain management its types, objectives, activities and technical challenges.
2. To know planning, forecasting, purchasing, manufacturing, moving, storing and tracking a product from conception to customer possession.
3. To understand CRM strategies in sales, marketing, and customer support and familiarise with different CRM technology solutions
4. To learn developing supply chain strategies, performance measure and assess internal integration of key processes
5. To acquaint with international supply chain management, methods of entry into foreign markets

Course Outcomes:

1. To understand the concepts of supply chain management and challenges.
2. To know purchasing issues, operation and distribution issues, facility location decision in supply chain management.
3. To analyse the different processes and design the strategic framework for CRM integration in the existing function of the organisation.
4. To develop supply chain strategies, performance measure and assess internal integration of key processes
5. To acquaint with international supply chain management, terms of payment and Incoterms.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2			2					2		1	1
CO2	1	2		2								2	1	1
CO3	1	2	2	2									2	2
CO4	1	2		2						2			2	2
CO5	1				2					2		2	2	2
Total	5	8	4	6	2	2				4	2	4	8	8
Average	1	2	2	2	2	2				2	2	2	1.6	1.6

Syllabus:

UNIT 1

Introduction to Supply Chain Management: Definition – Types of Supply Chain Management- Objectives of Supply Chain Management- Analysis of Supply Chain Management and their Constituents- Supply Chain Activities- Supply Chain Organization- Managing Technical Challenges of Supply Chain.

UNIT 2:

Supply Chain Management: An Overview: Purchasing Issues in Supply Chain Management- Operations and Distribution issues in Supply Chain Management- Facility Location Decisions- Domestic and International Transportation Management- Process Management.

UNIT 3:

Customer Relationship Management: Introduction-Definition- Role of Supply Chain Management in CRM- Key Tools and components of CRM- Segmenting Customers- Predicting Customer Behavior- Personalizing Customer Communications- Customer Service Capabilities- Designing and Implementing Successful CRM.

UNIT 4:

Sustaining Competitive Advantage: Supply Chain Process Integration- Review and Establish Supply Chain Strategies- Developing Supply Chain Performance Measure and asses Internal Integration of Key Processes- Extend Process Integration to Second Tier Supply Chain Partners- Performance Measurement

UNIT 5:

International Supply Chain Management: Introduction of International SCM- International Logistics Infrastructure – Methods of entry into Foreign Markets- International Contracts- Terms and Trades or Incoterms- Terms of Payments- Currency of Payments and Managing Transaction Risk- International Commercial Documents.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Joel D. Wisner, G. Keong Leong, Keah-Choon Tan: Principles of Supply Chain Management, Cengage learning, New Delhi, 2009.
2. Sarika Kulkarni, Ashok Sharma: Supply Chain Management, Tata Mc Grawhill Education Private Limited, 2010.
3. David, Stewart: International Supply Chain Management, *Cengage* learning, New Delhi, 2007.
4. B. Raja Sekhar, GVRK Acharyulu: Logistics and Supply Chain Management, Excel Books, New Delhi, 2009
5. G. Raghuram, N. Rangaraj: Logistics and Supply Chain Management, Mac Millan Business Books, New Delhi 2000.

SYSTEMS ELECTIVE 5

Sub Code: 18E2298541 **Name of the Course: BUSINESS INTELLIGENCE**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the concept of business intelligence, Architecture of BI- Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence.
2. To know the concept of data warehousing, Business Performance Management.
3. Aware of data mining techniques like classification, prediction, clustering and association rule mining
4. To understand the Value Preposition of Business Rules, Sources of business rules and management approach.
5. To examine Business Intelligence Implementation, Issues of legality- Privacy and ethics-Social networking and BI.

Course Outcomes

1. Demonstrate the concept of business intelligence, Architecture of BI- Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence.
2. Design data warehouse with dimensional modelling and apply OLAP operations.
3. Apply data mining techniques like classification, prediction, clustering and association rule mining.
4. Explore the Value Preposition of Business Rules, Sources of business rules and management approach.
5. Familiar with Business Intelligence Implementation, Issues of legality- Privacy and ethics-Social networking and BI.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1			2		2		2				2	1	1
CO3	1	2		2	3	2		2					2	2
CO4	1												2	2
CO5	1			2		2	2						2	2
Tot	5	2		6	3	6	2	4				2	8	8
Avg.	1	2		2	3	2	2	2				2	1.6	1.6

Syllabus:

UNIT-1

Introduction to Business Intelligence: The Business pressure-Responses and support model-Definition of BI- Architecture of BI- Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence-Value driven and Information use-Performance metrics and key performance indicators-horizontal use cases for BI.

UNIT-2

Data Ware Housing: Definitions and concepts-DW process an Innovation-Data Warehousing Implementation-Data warehousing Administration-Security Issues and future trends. Business Performance Management-Overview Strategic plan, monitor, performance measurement, BPM methodologies-BPM Techniques-Performance dashboard and scorecards

UNIT-3

Data Mining for Business Intelligence: Data mining concepts and definitions-Data mining applications - Artificial neural Networks for data mining - Text and web mining-Natural language processing-Text mining applications-Text mining process-tools-Web mining overview-Web content overview-Web structure mining-Web usage mining.

UNIT-4

Business Rules: The Value Preposition of Business Rules - Business rules approach-Business rule system - Sources of business rules and management approach.

UNIT -5

Business Intelligence Implementation: Business Intelligence and integration - Implementation - connecting in BI systems- Issues of legality- Privacy and ethics- Social networking and BI.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Amit Johri "Business Intelligence" Himalaya, 2012
2. Rajiv Sabherwal "Business Intelligence" Wiley Publications, 2012
3. Carlo Vercellis "Business Intelligence" Wiley Publications, 2012
4. Nina Godbole & Sunit Belapure " Cyber Security" Wiley india 2012.
5. Jawadekar, MIS Text and Cases, TMH, 2012
6. Efraim Turban et al. "Business Intelligence" 2e, Pearson Education, 2012

SYSTEMS ELECTIVE 6

Sub Code: 18E2298542 **Name of the Course: ENTERPRISE RESOURCE PLANNING**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the basic structure of ERP, SDLC and ERP life cycle
2. To identify reasons for ERP failure . pre – implementation Tasks,
3. To know the implementation strategy used for ERP.
4. To become familiar with Optimal Means of Developing an ERP, Project Evaluation Techniques.
5. To be aware of tools and methodology used for designing ERP for an Enterprise

Course Outcomes:

1. Familiar with the basic structure of ERP, SDLC and ERP life cycle.
2. Demonstrate the reasons for ERP failure, pre – implementation Tasks.
3. Aware of implementation strategy used for ERP.
4. Explore Optimal Means of Developing an ERP, Project Evaluation Techniques.
5. Apply tools and methodology used for designing ERP for an Enterprise.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1			2		2							1	1
CO3	1	2		2		2				2			2	2
CO4	1												2	2
CO5	1			2	3	2	2			2			2	2
Total	5	2		6	3	6	2			4		2	8	8
Average	1	2		2	3	2	2			2		2	1.6	1.6

Syllabus:

UNIT 1

Introduction to ERP: Overview of ERP – Introduction and Evaluation –advanced ERP-SCM and CRM systems and related technologies - ERP life cycle ERP implementation Life cycle-SDLC and ERP life cycle.

UNIT 2

ERP Implementation: reasons for ERP failure . pre – implementation Tasks – Implementation methodologies – Process definition – Dealing with employee resistance Training and Education – Project management and monitoring Success and failure factors of an ERP implementation.

UNIT 3

Post ERP implementation: Change Management – post implementation review, support, maintenance and security of ERP. Different business modules of an ERP package. ERP market place and market place dynamics

UNIT 4

ERP System Options and Selection Methods: Optimal Means of Developing an ERP, Measurement of Project Impact, IT Selection and Project Approval, ERP proposal Evaluation, Project Evaluation Techniques, Testing.

UNIT 5

ERP present and future: Turbo charge the ERP system- EAI - ERP. Internet and WWW-Future Directions and trends in ERP - Future Directions in ERP: New Markets, New Technologies, Faster Implementation Methodologies, New Business Segments, Trends in Security.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Singla: "Enterprise Resource Planning", Cengage Learning, New Delhi, 2013
2. Alexleon: "Enterprise Resource Planning", TMH, New Delhi, 2011
3. Mahadeo Jaiswal, Ganesh Vanapalli: "Enterprise Resource Planning", MacMillon, New Delhi, 2013
4. N.Venkateswaran: "Enterprise Resource Planning", SCITECH Publiscation, NewDelhi, 2009
5. S.Kesharwani, SBodduluri, M Ashok Kumar: "Enterprise Resource Planning", Paramount Publishing House, New Delhi, 2012

SYSTEMS ELECTIVE 7

Sub Code: 18E2298543 **Name of the Course: CYBER LAWS & SECURITY**

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand Threats to security, Government requirements, Information Protection and Access Controls.
2. Aware of Secure System Planning and administration.
3. To know the concepts of Information security policies and procedures.
4. To explain the fundamentals of Employee responsibilities-,Tools of information security, Information processing-secure program administration.
5. Acquaint with Organizational and Human Security, Role of information security professionals

Course Outcomes:

1. Outline the Threats to security, Government requirements, Information Protection and Access Controls.
2. Explore the Secure System Planning and administration.
3. Demonstrate the concepts of Information security policies and procedures.
4. Evaluate the fundamentals of Employee responsibilities- Tools of information security, Information processing-secure program administration.
5. Demonstrate Organizational and Human Security, Role of information security professionals.

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1	2		2		2							1	1
CO3	1	2		2		2							2	2
CO4	1	2			3								2	2
CO5	1			2		2	2						2	2
Total	5	6		6	3	6	2						8	8
Average	1	2		2	3	2	2						1.6	1.6

Syllabus:

UNIT 1

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT 2

Secure System Planning and administration: Introduction to the orange book, Security policy

requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT 3

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT 4

Information security: fundamentals-Employee responsibilities- information classification Information handling- Tools of information security- Information processing-secure program administration.

UNIT 5

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)", 2ndEdition, O' Reilly Media, 2006.

2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.

3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.

4. Thomas R Peltier, Justin Peltier and John blackley, "Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996

5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997

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SYSTEMS ELECTIVE 8

Sub Code: **18E2298544** Name of the Course: INFORMATION SYSTEMS AUDIT

Lecture – Tutorial - Practical:	4-0-0	**Internal Marks:**	40
Credits:	3	**External Marks:**	60

Course objectives:

1. To understand the Overview of Information System Auditing
2. To know the evaluation of planning function, Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process,
3. To be aware of Security Management Controls, Operations Management Controls Quality assurance Management Controls.
4. To examine Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques.
5. Acquainted with Evaluating Asset Safeguarding and Data Integrity and Managing the Information Systems Audit Function

Course Outcomes:

1. Outline the Overview of Information System Auditing
2. Demonstrate Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process
3. Apply Security Management Controls, Operations Management Controls Quality assurance Management Controls.
4. Explore Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques.
5. Evaluate Asset Safeguarding and Data Integrity and Managing the Information Systems Audit Function

Course Outcomes vs. POs Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1												1	1
CO2	1			2		2						2	1	1
CO3	1	3		2	3	2							2	2
CO4	1												2	2
CO5	1			2		2	2						2	2
Total	5	3		6	3	6	2					2	8	8
Average	1	3		2	3	2	2					2	1.6	1.6

Syllabus:

UNIT 1

Overview of Information System Auditing: Effect of Computers on Internal Controls, Effects of Computers on Auditing, Foundations of information Systems Auditing, Conducting an Information Systems Audit.

UNIT 2

The Management Control Framework-I: Introduction, Evaluation the Planning Function, Leading Function and Controlling Function, Systems Development - Management Controls, Approaches to Auditing Systems Development , Normative Models of the Systems Development Process, Evaluating the Major phases in the Systems Development Process, Programming Management Controls, Data Resource Management Controls.

UNIT 3

The Management Control Framework-II: Security Management Controls, Operations Management Controls Quality assurance Management Controls- Case Studies.

UNIT 4

Evidence Collection: Audit Software, Code Review, Test Data, and Code Comparison, Concurrent Auditing techniques, Interviews, Questionnaires, and Control Flowcharts. Performance Management tools- Case Studies.

UNIT 5

Evidence Evaluation: Evaluating Asset Safeguarding and Data Integrity, Evaluating System Effectiveness, Evaluating System Efficiency. Information Systems Audit and Management: Managing the Information Systems Audit Function,

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. Ron Weber: "Information Systems Control and Audit", Pearson Education,2013.
2. D P Dube: Information System Audit and Assurance, TMH, New Delhi,2008.