1.2.1(1)

Certified List of Courses for 2022-23

NRI INSTITUTE OF TECHNOLOGY

Pothavarappadu(v),Agiripalli(M), Vijayawada Rural-521 212

1.2.1(1)-Certified List of New Courses along with the Highlighted Course Structure for the A.Y. 2022-23

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

S.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	20A3101501	STRUCTURAL ANALYSIS	3	0	0	3	30	70	100	3
2	20A3101502	REINFORCED CONCRETE STRUCTURES	3	0	0	3	30	70	100	3
3	20A3101503	GEO-TECHNICAL ENGINEERING - I	3	0	0	3	30	70	100	3
4	20A3101511 20A3101512 20A3101513	OPEN ELECTIVE COURSE/JOB ORIENTED ELECTIVE (OE-1) STRENGTH OF MATERIALS FLUID MECHANICS SURVEYING AND GEOMATICS	3	0	0	3	30	70	100	3
5	20A3101521 20A3101522 20A3101523 20A3101524	PROFESSIONAL ELECTIVE COURSE – I CONSTRUCTION TECHNOLOGY AND MANAGEMENT REMOTE SENSING AND GIS ENVIRONMENTAL IMPACT ASSESEMENT RAILWAY ENGINEERING AND HARBOR ENGINEERING	3	0	0	3	30	70	100	3
6	20A3101591	PROFESSIONAL CORE COURSES LAB ADVANCED SURVEYING CAMP (FIELD WORK)	0	0	3	3	15	35	50	1.5
7	20A3101592	GEOTECHNICAL ENGINEERING LAB	0	0	3	3	15	35	50	1.5
8	20A3101593	SKILL ADVANCED COURSE: DESIGN OF SPECIAL STRUCTURES: CHIMNEY, INTZE TANKS, SPILL WAYS ETC.,	1	0	2	3	15	35	50	2
	20A3100801	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	0	0	2	30	70	100	0
10	20A3101594	SUMMER INTERNSHIP 2MONTHS (MANDATORY) AFTER SECOND YEAR (TO BE EVALUATED DURING V SEMESTER)								1.5
Total			**18**	**0**	**8**	**26**	**225**	**525**	**750**	21.5

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

PROFESSIONAL ELECTIVE-I
20A3101521 CONSTRUCTION TECHNOLOGY AND MANAGEMENT

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

Prerequisites : NONE

Course Objectives:

- To introduce the concept of project management including network drawing and monitoring
- To introduce various equipments like moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery, related to construction.
- To gain the knowledge of different hoisting and earthwork equipment usage in the construction.
- To introduce the importance of safety in construction projects
- To gain knowledge in different construction methods

Course Outcomes:

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

CO1	Understand the basics of construction project management
CO2	appreciate the importance of construction planning
CO3	understand the functioning of various earth moving equipment
CO4	know the methods of production of aggregate and concreting and usage of machinery required for the works.
CO5	apply the gained knowledge to project management and construction techniques
CO6	To gain knowledge in various construction methods

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

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

UNIT I

CONSTRUCTION PROJECT MANAGEMENT AND ITS RELEVANCE:
Qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical Path Method – Applications.

PROJECT EVALUATION AND REVIEW TECHNIQUE:
Cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT II

CONSTRUCTION EQUIPMENT:
Economic considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers.

UNIT III

HOISTING AND EARTHWORK EQUIPMENT:
Hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell

buckets.

UNIT IV

CONCRETING EQUIPMENT:

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

UNIT V

CONSTRUCTION METHODS:

Earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

TEXT BOOKS:

- Construction Planning Equipment and Methods, Peurifoy and Schexnayder , Shapira, Tata Mcgraw hill
- Construction Project Management Theory and Practice, Kumar Neeraj Jha (2011), Pearson.
- Construction Technology, Subir K. Sarkar and Subhajit Saraswati, Oxford University press.
- Project Planning and Control with PERT and CPM, B. C. Punamia and K K Khandelwal, Laxmi Publications Pvt Ltd. Hyderabad.

REFERENCE BOOKS:

- Construction Project Management - An Integrated Approach, Peter Fewings, Taylor and Francis
- Construction Management Emerging Trends and Technologies, Trefor Williams, Cengage learning.
- Hand Book of Construction Management, P. K. Joy, Trinity Press Chennai, New Delhi.

E-REFERENCES:

20A3101523 ENVIRONMENTAL IMPACT ASSESSMENT

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

PREREQUISITES: ENVIRONMENTAL ENGINEERING, AIR POLLUTION AND CONTROL, SOLID AND HAZARDOUS WASTE MANAGEMENT

Course Objectives:

- To impart knowledge on different concepts of Environmental Impact Assessment.
- To know procedures of risk assessment.
- To learn the EIA methodologies and the criterion for selection of EIA methods.
- To know the procedures for environmental clearances and audit.
- To gain the knowledge of different environmental regulations of Government of India.

Course Outcomes:

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

CO1	Explain the role of stakeholder and public hearing in the preparation of EIA
CO2	Proficient in basics of EIA
CO3	Proficient in environmental related laws
CO4	Proficient in components and methods for prediction and assessment of impacts of air, water, etc.
CO5	Proficient in documentation and monitoring
CO6	Proficient in preparing EIA report for Projects like Irrigation and power generation

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

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

UNIT I

INTRODUCTION:

Environmental Impact Assessment (EIA) – Objectives of EIA report – Contents of EIA – Environmental Impact Statement (EIS) – Environmental Risk Assessment (ERA) – Legal and regulatory aspects in India – Types and Limitations of EIA – Issues in EIA – National – Cross sectoral – social and cultural.

UNIT II

COMPONENTS AND METHODS:

Components – Scoping – Screening. Identifying and evaluating alternatives. Mitigating measures dealing with uncertainty. Issuing environmental statement matrices – networks – checklists; Importance assessment techniques – cost benefit analysis – analysis of alternatives – methods for prediction and assessment of impact – Air – Water – Soil – Noise – Biological – Cultural – Social – Economic Environments, Standards and Guidelines for evaluation. Public participation in Environmental

decision-making.

UNIT III

DOCUMENTATION AND MONITORING:

Document planning – collection and organization of relevant information – use of visual display materials – team writing – remainder checklists. Environmental monitoring – Guidelines – policies – planning of monitoring programs. Environmental management plan. Post project audit. Expert system in EIA.

UNIT IV

CASE STUDIES:

Case studies of EIA of developmental projects. Dams, Sardar Sarovar Irrigation Project, Highway Projects, Power generation and their Impacts.

UNIT V

EIA notification by Ministry of Environment and Forest (Govt. of India):

Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report. Environmental legislation objectives, evaluation of Audit data and preparation of Audit report. Post Audit activities, Concept of ISO and ISO 14000. Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

- Environmental Impact Assessment, Canter Larry W., McGraw-Hill education Edi (1996)
- Environmental Impact Assessment Methodologies, Y. Anjaneyulu, B. S. Publication, Sultan Bazar, Hyderabad.
- Glasson, John, and Riki Therivel. Introduction to environmental impact assessment. Routledge, 2013.
- Eccleston, Charles H. Environmental impact assessment. John Wiley & Sons, New York, 2000.

REFERENCE BOOKS:

- Environmental Science and Engineering, J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers
- Environmental Science and Engineering, Suresh K. Dhaneja, S. K. , Katania & Sons Publication., New Delhi.
- Environmental Pollution and Control, H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

E-REFERENCES:

1.

20A3101524 RAILWAY ENGINEERING AND HARBOR ENGINEERING

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

Prerequisites: SURVEYING AND GEO-METRICS, HIGHWAY ENGINEERING

Course Objectives:

- To know various components and their functions in a railway track
- To acquire design principles of geometrics in a railway track
- To know various techniques for the effective movement of trains.
- To know the planning, construction and maintenance of Docks
- To know the planning, construction and maintenance of Harbors.

Course Outcomes:

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

CO1	To know various components and their functions in a railway track
CO2	To acquire design principles of geometrics in a railway track
CO3	To know various techniques for the effective movement of trains by installing turnouts.
CO4	To know various techniques for the effective movement of trains using controls.
CO5	To know the planning, construction and maintenance of Docks
CO6	To know the planning, construction and maintenance of Harbors.

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

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

UNIT I

COMPONENTS OF RAILWAY ENGINEERING

Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

UNIT II

GEOMETRIC DESIGN OF RAILWAY TRACK

Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT III

TURNOUTS & CONTROLLERS

Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling

Train Movement – Interlocking – Modern signaling Installations.

UNIT IV

PLANNING, LAYOUT, CONSTRUCTION & MAINTENANCE OF DOCKS

History of Port Growth – Factors affecting Growth of Port. Classification of Harbours – Planning of A Port – Ship Characteristics as they Relate to Port Planning- Hydrographic and Oceanographic Data Required for Port Design –Classification of ports – Requirement of a good port – classification of Harbors – Docks - Dry & wet docks

UNIT V

PLANNING, LAYOUT, CONSTRUCTION & MAINTENANCE OF HARBORS

Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides - Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbors – Navigational aids. Determination of Best Location of a Harbor to Afford Maximum Protection- Minimum Maintenance and Facilities for Expansion.

TEXT BOOKS:

- Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
- Docks and Harbor Engineering, Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.

REFERENCE BOOKS:

- Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad.
- Highway, Railway, Airport and Harbor Engineering, Subramanian K. P, Scitech Publications (India) Pvt Limited, Chennai.
- Railway Engineering, Satish Chandra and Agarwal M. M., Oxford University Press, New Delhi.

E-REFERENCES:

20A3101593 SKILL ADVANCED COURSE

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

DESIGN OF SPECIAL STRUCTURES

- CHIMNEY,
- HINGE TANKS,
- SPILL WAYS.

20A3100801 ESSENCE OF INDIAN KNOWLEDGE AND TRADITIONS

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

Prerequisites: NONE

Course Objectives:

1. To develop knowledge of fundamental management concepts, skills and tools, to aid in problem solving and decision making.
2. To develop and understanding about the organizational structure and relationship between authority and responsibility in various structures.
3. 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.
4. To develop comprehensive skills in planning, selecting, motivating, and developing the human references for organizational effectiveness.
5. 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 references for organizational 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	PSO 1	PSO 2
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

UNIT-V

Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TEXT BOOKS:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375,2005.
2. "Science in Samskrit", Samskrita Bharti Publisher,ISBN-13:978-8187276333,2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450-494-X,2006.

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.

E- RESOURCES:

- https://www.youtube.com/watch?v=sSgj_GZOwU8

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	20A3201601	DESIGN AND DRAWING OF STEEL STRUCTURES	3	0	0	3	30	70	100	3
2	20A3201602	WATER RESOURCE ENGINEERING	3	0	0	3	30	70	100	3
3	20A3201603	GEOTECHNICAL ENGINEERING -2	3	0	0	3	30	70	100	3
4	20A3201611 20A3201612 20A3201613 20A3201614	PROFESSIONAL ELECTIVE COURSE –II ADVANCED STRUCTURAL ANALYSIS ARCHITECTURE AND TOWN PLANNING ROAD SAFETY ENGINEERING TRAFFIC ENGINEERING	3	0	0	3	30	70	100	3
5	20A3201621 20A3201622 20A3201623	OPEN ELECTIVE COURSE/JOB ORIENTED ELECTIVE (OE-2) ELEMENTS OF CIVIL ENGINEERING ENVIRONMENTAL ENGINEERING DISASTER MANAGEMENT	3	0	0	3	30	70	100	3
6	20A3101691	PROFESSIONAL CORE COURSES LAB ESTIMATION, COSTING AND CONTRACTS	0	0	3	3	15	35	50	1.5
7	20A3101691	PROFESSIONAL CORE COURSES LAB HIGHWAY DESIGN BY USING MX ROADS AND OPEN ROADS SOFTWARE	0	0	3	3	15	35	50	1.5
8	20A3101692	PROFESSIONAL CORE COURSES LAB CIVIL ENGINEERING PRACTICE : MANUAL DESIGNING OF A RESIDENTIAL BUILDING	1	0	2	3	15	35	50	1.5
9	20A3101693	SKILL ADVANCED COURSE/ SOFT SKILL COURSE: COMPUTATIONAL TOOLS	2	0	0	2	15	35	50	1.5
10	20A3201	EMPLOYABILITY SKILLS	2	0	0	2	30	70	100	0
11	20A3201	INDUSTRIAL/RESEARCH INTERNSHIP (MANDATORY) 2 MONTHS... TO BE EVALUATED IN IV YEAR I SEMESTER					30	70	100	1.5
Total			**20**	**0**	**8**	**28**				22.5

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

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20A3201611 ADVANCED STRUCTURAL ANALYSIS

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

Prerequisites: STRENGTH OF MATERIALS, STRUCTURAL ANALYSIS

Course Objectives:

- Familiarize Students with Different types of Structures.
- Equip student with concepts of Arches.
- Understand Analysis methods, Slope Deflection Method, Moment Distribution and Kanis Method.
- Understand Concepts of lateral Load analysis.
- Understand Analysis Methods Flexibility Matrix Method and Stiffness Matrix Method.

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	Analyze structures using Kani's Methods.
CO5	Carryout lateral Load analysis of structures.
CO6	Analyze structures using Matrix methods.

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

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

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.

UNIT-III

MOMENT DISTRIBUTION METHOD:

Analysis of single bay, single storey, portal frame including side sway.

KANI'S METHOD:

Analysis of continuous beams – including settlement of supports and single bay

portal frames with and without side sway.

UNIT IV

LATERAL LOAD ANALYSIS USING APPROXIMATE METHODS:

Application to building frames.

(i) Portal Method (ii) Cantilever Method.

UNIT V

MATRIX METHOD:

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

STIFFNESS METHOD:

Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

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.
4. Structural Analysis, C.S. Reddy, Tata Mc-Graw hill, New Delhi.

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.
4. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal-Laxmi Publications Pvt. Ltd., New Delhi.
5. Structural Analysis I, P.N. Chandramouli. Yesdee Publishing Pvt Limited.
6. Structural Analysis, Aslam Kassimali, Cengage Learning.
7. Matrix Methods of Structural Analysis, P.N. Godbole, R. S., Sonaparote, PHI Learning Pvt Limited.

E-REFERENCES :

- https://www.wipo.int/edocs/pubdocs/en/intproperty/450/wipo_pub_450.pdf
- https://www.icsi.edu/media/webmodules/publications/9.4%20Intellectual%20Property%20Rights.pdf
- https://lecturenotes.in/notes/20883-note-for-intellectual-property-rights-ipr-by-gyan-prakash

20A3201612 TOWN PLANNING AND ARCHITECTURE

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

Prerequisites: NONE

Course Objectives:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. Enabling the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, land scaping and expansion of towns.

Course Outcomes:

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

CO1	The student should be able to distinguish architectural styles of eastern and western world.
CO2	The student should understand the importance of Orders of architecture.
CO3	Should be able to compose spaces of buildings using design concepts, planning principles.
CO4	Should understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.
CO5	Should be able to understand modern town planning and standards of town planning.
CO6	Understand the Land Scaping and Expansion of Towns.

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

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

UNIT- I

HISTORY OF ARCHITECTURE:

WESTERN ARCHITECTURE:

Egyptian, Greek, Roman Architectures- Orders.

INDIAN ARCHITECTURE:

Vedic age, Indus valley civilization. Temples of religions.

Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT- II

PRINCIPLES OF DESIGNING AND PLANNING:

Principles of planninga residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

POST-CLASSIC ARCHITECTURE:

Introduction of post-classic architecture- contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT- III

HISTORICAL BACK GROUND OF TOWN PLANNING:

Town planning in India –Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT- IV

MODERN TOWN PLANNING:

Zoning- Roads and road traffic- Housing- Slums, Parks, Play groundsPublic Utility Services- Surveys and maps for planning- Neighborhood Planning.

STANDARDS OF TOWN PLANNING:

Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT-V

LAND SCAPING AND EXPANSION OF TOWNS:

Land scaping for the towns, horizontal and vertical expansion of towns- garden cities, satellite towns-floating towns- sky scrapers-pyramidal cities.

TEXT BOOKS:

1. The great ages of World Architecture by G.K. Hiraskar.
2. Planning and Design of Buildings by Section of Architecture by Y. S. Sane.
3. Professional Practice by G.K.Krishnamurthy, S.V.Ravindra, PHI Learning, New Delhi.
4. Indian Architecture – Vol. I & II by Percy Brown, Taraporevala Publications, Bombay.
5. Fundamentals of Town Planning by G.K.Haraskar.

REFERENCE BOOKS:

1. Drafting and Design for Architecture by Hepler, Cengage Learning
2. Architect's Portable Handbook by John Patten Guthrie – McGraw.Hill International Publications.

20A3201613 ROAD SAFETY ENGINEERING

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

Prerequisites: TRAFFIC ENGINEERING, HIGHWAY ENGINEERING.

Course Objectives:

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

Course Outcomes:

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

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

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

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

UNIT I

Road accidents, Trends, causes, Collision diagrams; Highway safety; Human factors and road user limitations; Speed and its effect on road safety; Vehicle factors; Highway safety in India. Multi-causal dynamic systems approach to safety; Crash Vs Accident; Road safety improvement strategies; Elements of a road safety plan, Safety data Needs; Safe vehicle design.

UNIT II

STATISTICAL INTERPRETATION AND ANALYSIS OF CRASH DATA:

Before-after methods in crash analysis, Recording of crash data; Accident Investigation and Analysis; Statistical testing and the role of chance; Black Spot Identification and Investigations, Case Studies.

UNIT III

ROAD SAFETY AUDITS:

Key elements of a road safety audit, Road Safety Audits & Investigations, Work zone safety audit; Crash investigation and analysis, Methods for identifying hazardous road locations, Case Studies.

UNIT IV

CRASH RECONSTRUCTION:

Describe the basic information that can be obtained from the roadway surface, Understand basic physics related to crash reconstruction, speed for various skid, friction, drag, and acceleration scenarios, variables involved in jump and

flip crashes, variables involved in pedestrian crashes, Case Studies.

UNIT-V

MITIGATION MEASURES:

Accident prevention by better planning, Accident prevention by better design of roads, Crash Countermeasures, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety; Safety in urban areas; Public transport and safety; Road safety policy making, Stakeholders involvement; Road safety law.

TEXT BOOKS:

1. The Traffic Safety Toolbox: A Primer on Traffic Safety, ITE, 1999. Towards Safe Roads in Developing country, Institute of Transportation Engineers (ITE), TRL – ODA, 2004

REFERENCE BOOKS:

1. Traffic Control and Road Accident Prevention, Athelstan Popkess, Chapman and Hall, 1997 (Digitized 2008).
2. Observational Before-After Studies in Road Safety, Ezra Hauer, Pergamon Press, 1997 (reprinted 2002).
3. Transport Planning and Traffic Safety: Making Cities, Roads, and Vehicles Safer, Geetam Tiwari and Dinesh Mohan, CRC Press, 2016.

20A3201614 TRAFFIC ENGINEERING

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

Prerequisites: HIGHWAY ENGINEERING

Course Objectives:

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

Course Outcomes:

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

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

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

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

UNIT- I

COMPONENTS OF THE TRAFFIC SYSTEM:

Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

UNIT- II

TRAFFIC CHARACTERISTICS:

Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial and model flow patterns; Interrupted and Un interrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car following theories; Density measurement techniques; Density contour maps.

UNIT- III

Traffic Control Devices & Highway Safety:

Traffic signs & Markings; Signal Warrants; Signal phasing and Development of phase plans; Fixed and Vehicle activated signals; Webster method; ARRB method;

Drew's Method; IRC method; Signal coordination; Area Traffic control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit.

UNIT- IV

HIGHWAY CAPACITY AND LEVEL OF SERVICE:

Capacity and level of service; Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards.

UNIT-V

INTELLIGENT VEHICLE HIGHWAY SYSTEMS:

Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS, Categories of ITS.

TEXT BOOKS:

1. Traffic Engineering: Theory and Practiceby Pignataro LJ., Prentice hall, Inc
2. Traffic and Transport planning by Kadiyali L.R., Khanna Publishers

REFERENCE BOOKS:

1. Traffic Engineering by Rogu P. Roess, Elena S. Prassas and William R. Mc Shane, Pearson India Education Services pvt. Ltd.
2. Traffic and Highway Engineering by Garber and Hoel, Cengage Learning India pvt. Ltd., Noida, New Delhi.

E-REFERENES :

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

20A3201623 DISASTER MANAGEMENT

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

Prerequisites: NONE

Course Objectives:

- To explain concepts of fluid mechanics used in Civil Engineering.
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To impart ability to solve engineering problems in fluid mechanics.
- To enable the student's measure quantities of fluid flowing in pipes, tanks and channels.
- To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
- To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:

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

CO1	Understand the principles of fluid statics, kinematics and dynamics
CO2	Familiarize basic terms used in fluid mechanics
CO3	Understand flow characteristics and classify the flows
CO4	Apply the continuity, momentum and energy principles
CO5	Estimate various losses in flow through channels
CO6	Understand fundamentals of kinematics and equations Cartesian coordinates.

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

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

UNIT I

INTRODUCTION:

Hazard, Risk, Vulnerability, Disaster, Meaning, Nature, Importance, Dimensions & Scope of Disaster Management, Disaster Management Cycle.

NATURAL DISASTERS:

Natural Disasters- Meaning and nature of natural disasters, their types and effects, Hydrological Disasters - Flood, Flash flood, Drought, Geological Disasters- Earthquakes, Tsunamis, Landslides, Avalanches, Volcanic eruptions, Mudflow.

UNIT II

TYPES OF NATURAL DISASTERS:

Wind related- Cyclone, Storm, Storm surge, Tidal waves, Heat and cold Waves, Climatic Change, Global warming, Sea Level rise, Ozone Depletion.

UNIT III

MAN – MADE DISASTERS:

CBRN – Chemical disasters, biological disasters, radiological disasters, nuclear disasters, Fire – building fire, coal fire, forest fire, Oil fire.

UNIT IV

TYPES OF MAN – MADE DISASTERS:

Accidents- road accidents, rail accidents, air accidents, sea accidents, Pollution - air pollution, water pollution, Deforestation, Industrial waste.

UNIT V

DISASTER DETERMINANTS:

Factors affecting damage – types, social status, habitation pattern, physiology and climate, Factors affecting mitigation measures, prediction, preparation, communication, area and accessibility, population, physiology and climate.

TEXT BOOKS:

- Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012).
- Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
- Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.

REFERENCE BOOKS:

- Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
- Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

E-REFERENCES:

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

III YEAR I SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A3102401	PCC	Power Systems-II	3	-	-	3
2	20A3102402	PCC	Power Electronics	3	-	-	3
3	20A3102403	PCC	Control Systems	3	-	-	3
4	20A3100601	SC	**Soft Skill Course: Employability Skills** Aptitude and Reasoning	3	-	-	3
5	20A3102511	PEC	**Professional Elective – I:** Utilization of Electrical Energy	3	-	-	3
6	20A3102491	PCC	Control Systems Lab	-	-	3	1.5
7	20A3102492	PCC	Power Electronics Lab	-	-	3	1.5
8	20A3102991	SC	**Skill oriented course :** IoT Lab	-	-	3	2
9	20A3102791	PROJ	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	-	-	-	1.5
							TOTAL CREDITS = 21.5
			Minors Course	4	0	0	4
			Honors Course	4	0	0	4

Category	Credits
Professional Core Courses	12
Professional Elective Courses	3
Skill advanced course/ Soft skill course	5
Summer Internship	1.5
TOTAL CREDITS	**21.5**

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CONTROL SYSTEMS

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

Course Objectives:

- To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
- To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers.
- To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
- To understand basic aspects of design and compensation of LTI systems using Bode diagrams.
- To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
- To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability.

Course Outcomes

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

CO1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
CO2	Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method.
CO3	Analyze the stability of LTI systems using frequency response methods.
CO4	Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams.
CO5	Represent physical systems as state models and determine the response.
CO6	Understand the concepts of controllability and observability.

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

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

UNIT I

Mathematical Modelling of Control Systems Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential equations of electrical networkstranslational and rotational mechanical systems - transfer function of Armature voltage controlled DC servo motor - block diagram algebra - signal flow graph – reduction using Mason's gain formula.

UNIT II

Time Response Analysis and Controllers Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) - proportional integral derivative (PID) systems.

Stability Assessment Techniques The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.

UNIT III

Frequency Response Analysis Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion-stability analysis using Bode plots (phase margin and gain margin).

UNIT IV

Classical Control Design Techniques Lag, lead, lag-lead compensators - physical realisation - design of compensators using Bode plots.

UNIT V

State Space Analysis of Linear Time Invariant (LTI) Systems Concepts of state - state variables and state model - state space representation of transfer function - diagonalization using linear transformation - solving the time invariant state equations - State Transition Matrix and its properties- concepts of controllability and observability.

TEXT BOOKS:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition.

REFERENCE BOOKS:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4thEdition.
2. Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3. Control Systems by Manik Dhanesh N, Cengage publications.
4. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5 th Edition.

SOFT SKILL COURSE
EMPLOYABLIITY SKILLS

Lecture – Tutorial:	3-1 Hours	Internal Marks:	15
Credits:	3	External Marks:	35

Course Objectives:

- To enhance the Numerical ability skills such as addition, subtraction, multiplication, division, calculation of percentages, average etc.
- To develop the problem solving skills on time, distance and speed calculations, to improve the basic mathematical skills on arithmetic ability.
- To analyze a candidate's ability to relate a certain given group of items and illustrate it diagrammatically.
- To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.by managing stress and time effectively.
- To prepare good resume, prepare for interviews and group discussions, and to explore desired career opportunities.

Course Outcomes

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

CO1	Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
CO2	Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
CO3	Analyze, summarize and present information in quantitative forms including table, graphs and formulas
CO4	Understand the core competencies to succeed in professional and personal life
CO5	Learn and demonstrate a set of practical skills such as time management, team leadership, etc.
CO6	Learn and demonstrate a set of practical skills such as, self-management, handling conflicts 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	2									1	
CO2	3	3	1	1							1	
CO3	3	3	1	1							1	
CO4	3	3	1	1							1	
CO5	3	3	1								1	
CO6	3	3	1								1	

UNIT I

Numerical ability Number system, HCF & LCM, Average, Simplification, Problems on numbers Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II

Arithmetical ability Problems on ages, Time & Distance, Problems on boats &Steams, Problems on Trains, Time & Work, Pipes & Cistern, Chain Rule. Allegation, Simple interest and compound interest. Races & Games of skills. Calendar and Clock.

UNIT III
Logical ability: Permutations and Combination and Probability. **Mensuration**: Geometry **Data interpretation:** Tabulation, Bar graphs, Pie charts, line graphs
UNIT IV
Self-Management Skills Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities Etiquette Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette
UNIT V
Job-Oriented Skills Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews
TEXT BOOKS:
1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017 ISBN:8121924987 2. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011. . Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
REFERENCE BOOKS:
1. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

CONTROL SYSTEMS LAB

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Course Objectives:

- To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers
- To understand time and frequency responses of control system with and without controllers and compensators.

List of Experiments

(Any 10 of the following experiments are to be conducted)

1. Time response of Second order system
2. Characteristics of Synchro's
3. Effect of P, PD, PI, PID Controller on a second order systems
4. Design of Lag and lead compensation – Magnitude and phase plot
5. Transfer function of DC motor
6. Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5th order using MATLAB.
7. Controllability and Observability Test using MAT LAB.
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Characteristics of DC servo motor
12. To study and verify the truth table of logic gates and simple Boolean expressions using PLC.

SKILL ORIENTED COURSE

IOT APPLICATIONS OF ELECTRICAL ENGINEERING

Lecture – Tutorial:	4-0 Hours	**Internal Marks:**	15
Credits:	2	**External Marks:**	35

Course Objectives:

To understand fundamentals of various technologies of Internet of Things.

To know various communication technologies used in the Internet of Things.

To know the connectivity of devices using web and internet in the IoT environment.

To understand the implementation of IoT by studying case studies like Smart Home, Smart city, etc.

List of Experiments:

(Any TEN of the following Experiments are to be conducted)

1. Familiarization with Arduino/Raspberry Pi and perform necessary softwareinstallation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ONLED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensordata to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature andhumidity data to thing speak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NRIA20 Course Structure

III YEAR II SEMESTER

Sl. No	Course Code	Course Category	Title of the Course	L	T	P	Total Credits
1	20A3202401	PCC	Microprocessors and Microcontrollers	3	-	-	3
2	20A3202402	PCC	Electrical Measurements and Instrumentation	3	-	-	3
3	20A3202403	PCC	Power System Analysis	3	-	-	3
4	20A3202511	PEC	**Professional Elective – II:** Switch Gear and Protection	3	-	-	3
5	20A3204605	OEC	**Open Elective –II/ Job Oriented Elective-II: Industrial Electronics**	3	-	-	3
6	20A3202491	PCC	Electrical Measurements and Instrumentation Lab	-	-	3	1.5
7	20A3202492	PCC	Microprocessors and Microcontrollers Lab	-	-	3	1.5
8	20A3202493	PCC	Power Systems and Simulation Lab	-	-	3	1.5
9	20A3202991	SC	**Skill Advanced Course:** Machine Learning with Python Lab*	-	-	-	2
10	20A3200801	MC	Research Methodology	-	-	-	0
							TOTAL CREDITS = 21.5
			Minors Course	4	0	0	4
			Honors Course	4	0	0	4

Category	Credits
Professional Core Courses	13.5
Professional Elective Courses	3
Skill advanced course/ Soft skill course	2
Open Elective Courses	3
Mandatory Course	0
TOTAL CREDITS	**21.5**

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ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

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

Course Objectives:

- To understand and analyze the factors that effect the various measuring units.
- To choose the appropriate meters for measuring of voltage, current, power, power factor and energy qualities & understand the concept of standardization.
- Describe the operating principle of AC & DC bridges for measurement of resistance, inductance and capacitance.
- To understand the concept of the transducer and their effectiveness in converting from one form to the other form for the ease of calculating and measuring purposes.
- To understand the operating principles of basic building blocks of digital systems, record and display units.

Course Outcomes

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

CO1	Know the construction and working of various types of analog instruments.
CO2	Describe the construction and working of wattmeter
CO3	Describe the construction and working of power factor meters
CO4	Know the construction and working various bridges for the measurement resistance - inductance and capacitance
CO5	Know the operational concepts of various transducers
CO6	Know the construction and operation digital meters

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

UNIT I

Analog Ammeter and Voltmeters Classification – deflecting - control and damping torques - – PMMC - moving iron type and electrostatic instruments - Construction - Torque equation - Range extension - Errors and compensations - advantages and disadvantages. Instrument transformers: Current Transformer and Potential Transformer-construction - theory - errors-Numerical Problems

UNIT II

Analog Wattmeters and Power Factor Meters Electrodynamometer type wattmeter (LPF and UPF) - Power factor meters: Dynamometer and M.I type (Single phase and Three phase) - Construction - theory - torque equation - advantages and disadvantages. Potentiometers: Introduction to DC and AC Potentiometers – Construction-working – Applications - Numerical Problems.

UNIT III

Measurements of Electrical parameters DC Bridges: Method of measuring low - medium and high resistance - sensitivity of Wheat stone's bridge - Kelvin's double bridge for measuring low resistance - Loss of charge method for measurement of high resistance - Megger – measurement of earth resistance - Numerical Problems. AC Bridges: Measurement of inductance and quality factor - - Maxwell's bridge - - Hay's bridge - - Anderson's bridge. Measurement of capacitance and loss angle - - Desauty's bridge - Schering Bridge - Wien's bridge - Wagner's earthing device - - Numerical Problems.

UNIT IV

Transducers Definition - Classification - Resistive - Inductive and Capacitive Transducer - LVDT - Strain Gauge - Thermistors - Thermocouples - Piezo electric and Photo Diode Transducers - Hall effect sensorsNumerical Problems.

UNIT V

Digital meters Digital Voltmeters – Successive approximation DVM - Ramp type DVM and Integrating type DVM – Digital frequency meter - Digital multimeter - Digital tachometer - Digital Energy Meter - Q meter - Power Analyzer. CRO- measurement of phase difference & Frequency using lissajious patterns - Numerical Problems.

TEXT BOOKS:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002.

REFERENCE BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition. 3. Electrical Measurements by Buckingham and Price - Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

SWITCH GEAR AND PROTECTION
(Professional Elective-II)

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

Course Objectives:

- To provide the basic principles and operation of various types of circuit breakers.
- To know the classification, operation and application of different types of electromagnetic protective relays.
- To explain protective schemes for generator and transformers.
- To gain the knowledge of various protective schemes used for feeders and bus bars.
- To explain the principle and operation of different types of static relays.
- To understand different types of over voltages in a power system and principles of different neutral grounding methods.

Course Outcomes

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

CO1	Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF6 gas type.
CO2	Analyse the working principle and operation of different types of electromagnetic protective relays.
CO3	Acquire knowledge of protective schemes for generator and transformers for different fault conditions.
CO4	Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays.
CO5	Analyse the operation of different types of over voltages protective schemes required for insulation co–ordination
CO6	Types of neutral grounding.

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

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

UNIT I

Circuit Breakers Application oriented evolution of Switchgear - Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching– Concept of oil circuit breakers– Description and operation of Air Blast– Vacuum and SF6 circuit breakers– Circuit Breaker ratings and specifications– Concept of Auto reclosing – Application Spectrum Numerical examples

UNIT II
Electromagnetic Protection Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays: Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays: Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.
UNIT III
Generator Protection Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples. Transformer Protection Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples
UNIT IV
Feeder and Bus bar Protection & Static Relays: Over current Protection schemes – PSM - TMS – Numerical examples – Carrier current and three zone distance relay using impedance relays. Protection of bus bars by using Differential protection. Static relays: Introduction – Classification of Static Relays – Basic Components of Static Relays.
UNIT V
Protection against over voltage and grounding Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters. Grounded and ungrounded neutral systems – Effects of ungrounded neutral on system performance – Methods of neutral grounding: Solid–resistance–Reactance–Arcing grounds and grounding Practices.
TEXT BOOKS:
1. Power System Protection and Switchgear by Badri Ram and D.N Viswakarma - Tata McGraw Hill Publications - 2nd edition - 2011. 2. Power system protection- Static Relays with microprocessor applications by T.S.Madhava Rao - Tata McGraw Hill - 2nd edition.
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 SwitchGear by BhaveshBhalja - R.P. Maheshwari - Nilesh G.Chothani - Oxford University Press - 2013.

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LABORATORY

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Course Objectives:

- To understand students how different types of meters work and their construction.
- To make the students understand how to measure resistance, inductance and capacitance by AC & DC bridges.
- To understand the testing of CT and PT. x To Understand and the characteristics of Thermo couples, LVDT, Capacitive transducer, piezoelectric transducer. x To understand the measurement of strain and choke coil parameters. To study the procedure for standardization and calibration of various methods.

List of Experiments

Any 10 of the following experiments are to be conducted

1. Calibration of dynamometer wattmeter using phantom loading

2. Measurement of resistance using Kelvin's double Bridge and Determination of its tolerance.

3. Measurement of Capacitance using Schering Bridge.

4. Measurement of Inductance using Anderson Bridge.

5. Calibration of LPF Wattmeter by direct loading.

6. Measurement of 3 phase reactive power using single wattmeter method for a balanced load.

7. Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null deflection method. 8. P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.

9. Determination of the characteristics of a Thermocouple.

10. Determination of the characteristics of a LVDT.

11. Determination of the characteristics for a capacitive transducer.

12. Measurement of strain for a bridge strain gauge.

13. Measurement of Choke coil parameters and single phase power using three voltmeter and three ammeter methods. 14. Calibration of single phase Energy Meter.

15. Dielectric oil Test using HV Kit.

16. Calibration of DC ammeter and voltmeter using Crompton DC Potentiometer.

17. AC Potentiometer: Polar Form / Cartesian Form - Calibration of AC voltmeter - Parameters of choke.

MICROPROCESSORS AND MICRCONTROLLERS LABORATORY

Lecture – Tutorial:	3-0 Hours	Internal Marks:	15
Credits:	1.5	External Marks:	35

Course Objectives:

- To study programming based on 8086 microprocessor and 8051 microcontroller.
- To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
- To study to interface 8086 with I/O and other devices.
- To study parallel and serial communication using 8051& PIC 18 micro controllers.

List of Experiments

8086 Microprocessor Programs:

1. Arithmetic operations – Two 16-bit numbers and multibyte addition - subtraction - multiplication and division – Signed and unsigned arithmetic operations - ASCII – Arithmetic operations.

2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD - BCD to ASCII conversion

3. Arrange the given array in ascending and descending order

4. Determine the factorial of a given number

5. By using string operation and Instruction prefix: Move block - Reverse string Sorting - Inserting - Deleting - Length of the string - String comparison.

6. Find the first and nth number of 'n' natural numbers of a Fibonacci series.

7. Find the number and sum of even and odd numbers of a given array

8. Find the sum of 'n' natural numbers and squares of 'n' natural numbers

9. Arithmetic operations on 8051

10. Conversion of decimal number to hexa equivalent and hexa equivalent to decimal number

11. Find the Sum of elements in an array and also identify the largest & smallest number of a given array using 8051.

Programs on Interfacing:

12. Interfacing 8255–PPI with 8086.

13. Stepper motor control using 8253/8255.

14. Reading and Writing on a parallel port using 8051

15. Timer in different modes using 8051

16. Serial communication implementation using 8051

17. Understanding three memory areas of 00 – FF Using 8051 external interrupts.

18. Traffic Light Controller using 8051.

POWER SYSTEMS AND SIMULATION LAB

Lecture – Tutorial:	3-0 Hours	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Course Objectives:

- Estimate the sequence impedances of 3-phase Transformer and Alternators
- Evaluate the performance of transmission lines
- Analyse and simulate power flow methods in power systems
- Analyse and simulate the performance of PI controller for load frequency control
- Analyse and simulate stability studies of power systems.

List of Experiments

Any of 5 experiments are to be conducted from each section:

Section I: Power Systems Lab:

1. Estimation of sequence impedances of 3-phase Transformer
2. Estimation of sequence impedances of 3-phase Alternator by Fault Analysis
3. Estimation of sequence impedances of 3-phase Alternator by Direct method
4. Estimation of ABCD parameters on transmission line model
5. Performance of long transmission line without compensation
6. Performance of long transmission line with shunt compensation
7. Analyze the Ferranti effect on long transmission line

Section II: Simulation Lab

8. Determination of Y bus using direct inspection method
9. Load flow solution of a power system network using Gauss-Seidel method
10. Load flow solution of a power system network using Newton Raphson method.
11. Formation of Z bus by building algorithm.
12. Economic load dispatch with & without losses
13. Load frequency control of a two area Power System without & with PI controller
14. Transient Stability analysis of single machine connected to an infinite bus (SMIB) using equal area criterion

SKILL ADVANCED COURSE

MACHINE LEARNING WITH PYTHON

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

Course Objectives:

The student will learn

- Patterns and concepts from data without being explicitly programmed in various IOT nodes.
- To design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- To explore supervised and unsupervised learning paradigms of machine earning, Deep learning technique and various feature extraction strategies.

Course Outcomes

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

CO1	Illustrate and comprehend the basics of Machine Learning with Python
CO2	Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
CO3	Demonstrate the algorithms of Unsupervised Learning
CO4	Able to understand the clustering algorithms
CO5	Evaluate the concepts of binning, pipeline Interfaces with examples
CO6	Apply the sentiment analysis for various case studies

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

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

UNIT I

Introduction to Machine Learning with Python

Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikitlearn, Tiny application of Machine Learning

UNIT II

Supervised Learning

Types of Supervised Learning, Supervised Machine Learning Algorithms: k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

UNIT III

Unsupervised Learning

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

Course Objectives:

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

Course Outcomes

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

CO1	Illustrate advantages of digital systems, sampling and data reconstruction.
CO2	Calculate Z Transform and Inverse Z Transfer function, pulse transfer functions of open andclosed loop response.
CO3	Construct various canonical forms and concepts of controllability and observability.
CO4	Compute the absolute and relative stability of discrete time systems using Routh Stabilitycriterion and Root Locus
CO5	Design lag and lead compensators to improve system performance using bode diagrams.
CO6	Design of state feedback controllers and state observers.

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

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

UNIT I

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

UNIT V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

TEXT BOOKS:

1.Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"

REFERENCE BOOKS:

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
2. Mayall, "Industrial Design", McGraw Hill, 1992.
3. Niebel, "Product Design", McGraw Hill, 1974.
4. Asimov, "Introduction to Design", Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New TechnologicalAge", 2016.
6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

DIGITAL CONTROL SYSTEMS

(Honors Engineering Course)

RESEARCH METHODOLOGY

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

Course Objectives:

- To understand the objectives and characteristics of a research problem.
- To analyze research related information and to follow research ethics
- To understand the types of intellectual property rights.
- To learn about the scope of patent rights.
- To understand the new developments in IPR.

Course Outcomes

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

CO1	Understand objectives of a research problem
CO2	Understand characteristics of a research problem
CO3	Analyze research related information and to follow research ethics.
CO4	Understand the types of intellectual property rights.
CO5	Learn about the scope of IPR.
CO6	Understand the new developments in IPR.

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

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

UNIT I

Research problem: Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Literature study: Effective literature studies approaches, analysis Plagiarism, Research ethics, Technical writing: Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright.
Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT IV
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.
UNIT V
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.
TEXT BOOKS:
1.Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'" 2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction" 3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
REFERENCE BOOKS:
1. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007. 2. Mayall, "Industrial Design", McGraw Hill, 1992. 3. Niebel, "Product Design", McGraw Hill, 1974. 4. Asimov, "Introduction to Design", Prentice Hall, 1962. 5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New TechnologicalAge", 2016. 6. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

NRI INSTITUTE OF TECHNOLOGY

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

DEPARTMENT OF MECHANICAL ENGINEERING

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	PCC	Thermal Engineering-II	3	0	0	3	30	70	100	3
2	PCC	Design of Machine Members-I	3	0	0	3	30	70	100	3
3	PCC	Machining, Machine Tools & Metrology	3	0	0	3	30	70	100	3
4	OE-I	1. Sustainable Energy Technologies 2. Operations Research 3. Nano Technology 4. Thermal Management of Electronic systems	3	0	0	3	30	70	100	3
5	PE-I	1. Finite Element Methods 2. Industrial Robotics 3. Advanced Materials 4. Renewable Energy Sources 5. Mechanics of Composites 6. MOOCs (NPTEL/ Swayam) Course (12 Week duration)	3	0	0	3	30	70	100	3
6	PCC-L	Machine Tools Lab	0	0	3	3	15	35	50	1.5
7	PCC-L	Thermal Engineering Lab	0	0	3	3	15	35	50	1.5
8	SOC	Advanced Communication Skills Lab	1	0	2	3	15	35	50	2
9	MC	Professional Ethics and Human Values	2	0	0	2	30	70	100	0
	Evaluation of summer internship which is completed at the end of II B.Tech II Semester									1.5
	Total		**18**	**0**	**8**	**26**	**225**	**525**	**750**	**21.5**
	Honors/Minor courses		4	0	0	4	30	70	100	4

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	20A3203401 (PCC)	Heat Transfer	3	0	0	3	30	70	100	3
2	20A3203402 (PCC)	Design of Machine Members-II	3	0	0	3	30	70	100	3
3	20A3203403 (PCC)	CAD/CAM	3	0	0	3	30	70	100	3
4	PE-II	1.Automobile Engineering 2.Smart Manufacturing 3.Advanced Mechanics of Solids 4.Statistical Quality Control 5.Industrial Hydraulics and Pneumatics 6.MOOCs (NPTEL/ Swayam) Course (12 Week duration)	3	0	0	3	30	70	100	3
5	OE-II	1.Industrial Robotics 2.Essentials of Mechanical Engineering 3.Advanced Materials 4.Introduction to Automobile Engineering	3	0	0	3	30	70	100	3
6	20A3203491 (PCC-L)	Heat Transfer Lab	0	0	3	3	15	35	50	1.5
7	20A3203492 (PCC-L)	CAE&CAM Lab	0	0	3	3	15	35	50	1.5
8	20A3203493 (PCC-L)	Measurements & Metrology Lab	0	0	3	3	15	35	50	1.5
9	20A3203791 (MINI-PR)	Mini Project (Design & Fabrication)	0	0	4	4	30	70	100	2.0
10	20A3200802 (MC)	Research Methodology and IPR	2	0	0	2	30	70	100	0
	Total		**17**	**0**	**13**	**30**	**285**	**595**	**850**	**21.5**
	Honors/Minor courses		4	0	0	4	30	70	100	4

L - LECTURE T - TUTORIAL P - PRACTICAL

CIA – Continuous Internal Assessment SEA – Semester End Assessment

- **At the end of III Year II Semester Students shall complete summer Internship spanning between 1 to 2 months (minimum of 4 weeks) at industry/ higher learning institutions/APSSDC.**

COURSES FOR B. Tech. (MINOR) in MECHANICAL ENGINEERING

S No	Name of the Course	Pre-requisites
1.	Basic Thermodynamics	NIL
2.	Manufacturing Processes	NIL
3.	Materials Science and Engineering	NIL
4.	Basic Mechanical Design	NIL
5.	Optimization Techniques	NIL
6.	Power Plant Engineering	Basic Thermodynamics
7.	Automobile Engineering	Basic Thermodynamics
8.	Industrial Engineering and Management	NIL
9.	Product Design & Development	NIL
10.	Smart Manufacturing	NIL
11.	Mechanical Measurements	NIL
12.	Industrial Robotics	Engineering Mechanics
13.	Mechatronics	NIL

COURSES FOR B. Tech. (HONORS) in MECHANICAL ENGINEERING

S No	Name of the Course	Pre-requisites
	POOL – 1 (in II-II)	
1.	Advanced Mechanics of Fluids	Fluid Mechanics
2.	Green Manufacturing	Production Technology
3.	Analysis and Synthesis of Mechanisms	Kinematics of Machinery
4.	Alternative Fuels Technologies	Basic Thermodynamics
5.	Gear Engineering	Kinematics of Machinery
	POOL-2 (in III-I)	
1.	Experimental Methods in Fluid Mechanics	Fluid Mechanics
2.	Advanced Optimization Techniques	Operations Research
3.	Micro Electro Mechanical Systems	Nil
4.	Tribology	Nil
5.	Statistical Design in Quality Control	Nil
	POOL-3 (in III-II)	
1.	Advanced Computational Fluid Dynamics	Fluid Mechanics
2.	Material Characterization Techniques	Material Science and Metallurgy
3.	Product Design	Nil
4.	Electric & Hybrid Vehicles	Thermal Engineering
5.	Mechanical Vibrations & Acoustics	Nil
	POOL-4 (in IV-I)	
1.	Advanced Thermodynamics	Nil
2.	Design for Manufacturing and Assembly	Production Technology
3.	Robotics and Control	Kinematics of Machinery
4.	Turbo Machines	FM&HM
5.	Materials Technology	Nil

III B.TECH I SEMESTER

Course Code:
THERMAL ENGINEERING-II
(Steam Tables and Mollier chart is allowed)

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

Prerequisites: Thermodynamics, Thermal Engineering-I

Course Objectives

1) To understand the basic concepts of thermal engineering and boilers.
2) To gain knowledge about the concepts of steam nozzles and steam turbines.
3) To gain knowledge about the concepts of reaction turbine and steam condensers.
4) To understand the concepts of reciprocating and rotary type of compressors.
5) To acquire knowledge about the centrifugal and axial flow compressors.

Course Outcomes

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

CO1	Explain the basic concepts of thermal engineering and boilers.
CO2	Demonstrate the concepts of steam nozzles and steam turbines.
CO3	Apply the basic concepts of reaction turbines and steam condensers.
CO4	Develop the concepts of reciprocating and rotary type of compressors.
CO5	Explain the concepts of centrifugal and axial flow 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	√	√	√	√	√							√
CO2	√	√	√	√	√							√
CO3	√	√	√	√	√							√
CO4	√	√	√	√	√							√
CO5	√	√	√	√	√							√

UNIT I

BASIC CONCEPTS: Rankine cycle - schematic layout, thermodynamic analysis, concept of mean temperature of heat addition, methods to improve cycle performance – regeneration & reheating. combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, Stoichiometry, flue gas analysis.

BOILERS: Classification – working principles of L.P & H.P boilers with sketches – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – Draught: classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT II

STEAM NOZZLES: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis – assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to

decide nozzle shape: Super saturated flow - its effects, degree of super saturation and degree of under cooling, Wilson line.

STEAM TURBINES: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity & pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency.

UNIT III

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency – calculation of blade height.

STEAM CONDENSERS: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump, cooling water requirement.

UNIT IV

COMPRESSORS: Classification – fan, blower and compressor – positive displacement and non-positive displacement type – reciprocating and rotary types.

RECIPROCATING: Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, saving of work, minimum work condition for two stage compression.

ROTARY: Roots Blower, vane sealed compressor, Lysholm compressor –mechanical details and principle of working – efficiency considerations.

UNIT V

CENTRIFUGAL COMPRESSORS: Mechanical details and principle of operation –velocity and pressure variation. Energy transfer-impeller blade shape-losses,slip factor, power input factor, pressure coefficient and adiabatic coefficient– velocity diagrams – power.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor – isentropic efficiency-pressure rise calculations – Poly tropic efficiency.

Text Book:

1) Thermodynamics and Heat Engines/R.Yadav, Volume -II /Central Publishing House
2) Heat Engineering /V.P Vasandani and D.S Kumar/Metropolitan Book Company, New Delhi.

REFERENCE BOOKS:

1) Thermal Engineering-M.L.Mathur & Mehta/Jain bros. Publishers
2) Thermal Engineering-P.L.Ballaney/ Khanna publishers.
3) Thermal Engineering / RK Rajput/ Lakshmi Publications
4) Thermal Engineering-R.S Khurmi, &J S Gupta/S.Chand.

III B.TECH I SEMESTER

Course Code:

DESIGN OF MACHINE MEMBERS-I

(Design Data book allowed)

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

Prerequisites: None

Course Objectives

1) To understand the materials and their properties along with manufacturing considerations.
2) To gain knowledge about the strength of machine elements.
3) To understand and apply the knowledge in designing the riveted and welded joints, keys, cotters and knuckle joints.
4) To understand and apply the knowledge in designing the shafts and shaft couplings.
5) To understand and apply the knowledge in designing the mechanical springs.

Course Outcomes

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

CO1	Classify different types of materials and their properties along with manufacturing considerations.
CO2	Develop the knowledge about the strength of machine elements.
CO3	Apply the knowledge in designing the riveted and welded joints, keys, cotters and knuckle joints.
CO4	Analyze the knowledge in designing the shafts and shaft couplings.
CO5	Apply the knowledge in designing the mechanical springs.

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

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

UNIT I

INTRODUCTION: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design, tolerances and fits –BIS codes of steels- ASHBY Charts.

STRESSES IN MACHINE MEMBERS: Simple stresses – combined stresses – torsional and bending stresses – impact stresses – stress strain relation – various theories of failure – factor of safety – design for strength and rigidity – preferred numbers-concept of stiffness in tension, bending, torsion and combined situations – static strength design based on fracture toughness.

UNIT II

STRENGTH OF MACHINE ELEMENTS: Stress concentration – theoretical stress concentration factor – fatigue stress concentration factor notch sensitivity – design for fluctuating stresses – endurance limit – estimation of endurance strength – Goodman's line – Soderberg's line

– modified goodman's line
UNIT III
RIVETED AND WELDED JOINTS – design of joints with initial stresses – eccentric loading. Bolted joints – design of bolts with pre-stresses – design of joints under eccentric loading – locking devices – both of uniform strength, different seals. **KEYS, COTTERS AND KNUCKLE JOINTS:** Design of keys-stresses in keys-cotter joints-spigot and socket-sleeve and cotter-jib and cotter joints- knuckle joints.
UNIT IV
SHAFTS: Design of solid and hollow shafts for strength and rigidity – design of shafts for combined bending and axial loads – shaft sizes – BIS code- Use of internal and external circlips-gaskets and seals (stationary & rotary). **SHAFT COUPLING:** Rigid couplings – muff, split muff and flange couplings, flexible couplings – flange coupling (modified).
UNIT V
MECHANICAL SPRINGS: Stresses and deflections of helical springs – extension -compression springs – springs for fatigue loading, energy storage capacity – helical torsion springs – co-axial springs, leaf springs.
Text Book: 1. Machine design / NC Pandya & CS Shah/Charotar Publishing House Pvt. Limited 2. Machine Design/V.B.Bhandari/ McGraw-Hill Education
REFERENCE BOOKS:
1. Design of Machine Elements / V.M. Faires/McMillan 2. Machine design / Schaum Series/McGraw-Hill Professional 3. Machine Design/ Shigley, J.E/McGraw Hill. 4. Design data handbook/ K.Mahadevan & K. Balaveera Reddy/ CBS publishers. 5. Machine Design –Norton/ Pearson publishers

III B.TECH I SEMESTER

Course Code:

MACHINING, MACHINE TOOLS & METROLOGY

Lecture – Practical:	3-0 Hours	**Internal Marks:**	30
Credits	3	**External Marks:**	70
Prerequisites: None			
Course Objectives			
1) To gain fundamental knowledge of machining processes. 2) To understand the principles of lathe, shaping, slotting and planning machines. 3) To demonstrate the principles of drilling, milling and boring processes. 4) To understand the concepts of finishing processes and the system of limits and fits. 5) To gain knowledge about the concepts of surface roughness and optical measuring instruments.			
Course Outcomes			
Upon successful completion of the course, the student will be able to:			
CO1	Demonstrate the concepts of machining processes.		
CO2	Apply the principles of lathe, shaping, slotting and planning machines.		
CO3	Apply the principles of drilling, milling and boring processes.		

CO4	Analyze the concepts of finishing processes and the system of limits and fits.
CO5	Understand the concepts of surface roughness and optical measuring instruments.

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

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

UNIT I

FUNDAMENTAL OF MACHINING:

Elementary treatment of metal cutting theory – element of cutting process – Single point cutting tools, nomenclature of single point cutting tool, tool signature, tool angles, mechanism of metal cutting, types of chips and chip formation – built up edge and its effects, chip breakers, mechanics of orthogonal and oblique cutting –Merchant's force diagram, cutting forces, velocity ratio, cutting speeds, feed, depth of cut, tool life, Taylor's tool life equation, simple problems - Tool wear, tool wear mechanisms, machinability, economics of machining, coolants, tool materials and properties.

UNIT II

LATHE MACHINES:

Introduction- types of lathe - Engine lathe – principle of working - construction - specification of lathe - work holders and tool holders – accessories and attachments – lathe operations – taper turning methods and thread cutting – drilling on lathes – cutting speed and feed-depth of cut.

SHAPING, SLOTTING AND PLANNING MACHINES: Introduction - principle of working – principle parts – specifications - operations performed - slider crank mechanism - machining time calculations.

UNIT III

DRILLING & BORING MACHINES: Introduction – construction of drilling machines – types of drilling machines - principles of working – specifications- types of drills – geometry of twist drill - operations performed –cutting speed and feed – machining time calculations - Boring Machines – fine Boring Machines – jig boring machines - deep hole Drilling Machines.

MILLING MACHINES: Introduction - principle of working – specifications – milling methods - classification of Milling Machines –types of cutters - geometry of milling cutters – methods of indexing, accessories to milling machines - cutting speed and feed – machining time calculations

UNIT IV

FINISHING PROCESSES: Introduction - theory of grinding – classification of grinding machines- cylindrical and surface grinding machines- tool and cutter grinding machines- different types of abrasives- bonds, specification and selection of a grinding wheel-lapping, Honing & Broaching operations- comparison to grinding.

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, different types of fits -Unilateral and bilateral tolerance system, hole and shaft basis systems-interchangeability, deterministic & statistical tolerances, selective assembly- International standard system of tolerances, selection of limits and tolerances for correct functioning, simple

problems related to limits and fits, Taylor's principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges – inspection of gauges.

UNIT V

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, simple problems - method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

OPTICAL MEASURING INSTRUMENTS: Tools maker's microscope, Autocollimators, Optical projector, Optical flats-working principle, construction, merits, demerits and their uses. optical comparators.

Text Book:

1) Manufacturing Processes / JP Kaushish/ PHI Publishers-2nd Edition
2) Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill
3) Engineering Metrology – R.K. Jain/Khanna Publishers

REFERENCE BOOKS:

1) Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
2) Production Technology / H.M.T. Hand Book (Hindustan Machine Tools).
3) Production Engineering/K.C Jain & A.K Chitaley/PHI Publishers
4) Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
5) Manufacturing Processes for Engineering Materials-Kalpak Jian S & Steven R Schmid/Pearson Publications 5th Edition

III B.TECH I SEMESTER

Course Code:
SUSTAINABLE ENERGY TECHNOLOGIES
(OPEN ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To demonstrate the importance of solar energy collection and storage.
2) To understand the principles of wind energy and biomass energy.
3) To gain knowledge on geothermal and ocean energy.
4) To acquire knowledge about energy efficient systems.
5) To understand the concepts of green manufacturing systems.

Course Outcomes

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

CO1	Explain the importance of solar energy collection and storage.
CO2	Apply the principles of wind energy and biomass energy.
CO3	Analyze knowledge on geothermal and ocean energy.
CO4	Develop the knowledge about energy efficient systems.
CO5	Define the concepts of green manufacturing 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	√	√	√	√			√					√
CO2	√	√	√	√			√					√
CO3	√	√	√	√			√					√
CO4	√	√	√	√			√					√
CO5	√	√	√	√			√					√

UNIT I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT II

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT III

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.

UNIT IV

ENERGY EFFICIENT SYSTEMS:

(A) **ELECTRICAL SYSTEMS**: Energy efficient motors, energy efficient lighting and control, selection of luminaries, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

(B) MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, Environmental friendly and Energy efficient compressors and pumps.

UNIT V

GREEN MANUFACTURING SYSTEMS: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmental friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

Text Book:
1) Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH.
2) Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006.
3) Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013.

REFERENCE BOOKS:
1) Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New Age International.
2) Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth & John F Kreider /Taylor & Francis.
3) Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd.
4) Renewable Energy Technologies -Ramesh & Kumar /Narosa.
5) Non-conventional Energy Source- G.D Roy/Standard Publishers.
6) Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd.
7) Fuel Cell Technology -Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

III B.TECH I SEMESTER

Course Code:
OPERATIONS RESEARCH
(OPEN ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To understand the basics of operations research, applications and linear programming problems.
2) To understand and apply the knowledge in solving problems of transportation, assignment and sequencing.
3) To understand the replacement and game theories and apply the knowledge to solve problems.
4) To gain knowledge about the waiting line models and project management techniques.
5) To understand and apply the knowledge in solving problems of dynamic programming and simulation.

Course Outcomes

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

CO1	Apply the basics of operations research and linear programming problems.
CO2	Apply the knowledge in solving problems of transportation, assignment and Sequencing.
CO3	Analyze the replacement and game theories and apply the knowledge to solve problems.
CO4	Demonstrate the waiting line models and project management techniques.
CO5	Apply the knowledge in solving problems of dynamic programming and simulation.

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

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

CO2	√	√	√	√	√							
CO3	√	√	√	√	√							
CO4	√	√	√	√	√							
CO5	√	√	√	√	√							

UNIT I

INTRODUCTION - definition– characteristics and phases – types of operation research models – applications.

LINEAR PROGRAMMING: Problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy, assignment problem – formulation – optimal solution - variants of assignment problem- travelling salesman problem.

SEQUENCING – Introduction – flow –shop sequencing – *n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through 'm' machines.

UNIT III

REPLACEMENT THEORY: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

GAME THEORY: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

UNIT IV

WAITING LINES: Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel.

PROJECT MANAGEMENT: Basics for construction of network diagram, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM) – PERT Vs. CPM, determination of floats- Project crashing and its procedure.

UNIT V

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality – applications of dynamic programming-shortest path problem – linear programming problem.

SIMULATION: Definition – types of simulation models – phases of simulation– applications of simulation – inventory and queuing problems – advantages and disadvantages.

Text Book:

1. Operations Research-An Introduction/Hamdy A Taha/Pearson publishers
2. Operations Research –Theory & publications / S.D.Sharma-Kedarnath/McMillan publishers India Ltd.

REFERENCE BOOKS:

1. Introduction to O.R/Hiller & Libermann/TMH
2. Operations Research /A.M. Natarajan, P. Balasubramani, A. Tamilarasi /Pearson Education.
3. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman/Wiley
4. Operations Research / R.Pannerselvam/ PHI Publications.
5. Operations Research / Wagner/ PHI Publications.
6. Operation Research /J.K.Sharma/Macmillan Publ.
7. Operations Research/ Pai/ Oxford Publications

8. Operations Research/S Kalavathy / Vikas Publishers
9. Operations Research / DS Cheema/University Science Press
10. Operations Research / Ravindran, Philips, Solberg / Wiley publishers

III B.TECH I SEMESTER

Course Code:
NANO TECHNOLOGY
(OPEN ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To understand the nano-structured materials and their applications.
2) To gain knowledge about the nano crystalline materials, their properties and defects.
3) To understand various techniques of nanofabrication.
4) To identify the tools to characterize nano materials.
5) To analyze the applications of nano materials.

Course Outcomes

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

CO1	Explain about nano-structured materials and their applications.
CO2	Apply knowledge about the nano crystalline materials, their properties and defects.
CO3	Justify various techniques of nanofabrication.
CO4	Apply the tools to characterize nano materials.
CO5	Analyze the applications of nano materials.

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

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

UNIT I

INTRODUCTION: History and Scope, Classification of Nano structured Materials, Fascinating Nanostructures, and applications of nano-materials, challenges and future prospects.

UNIT II

UNIQUE PROPERTIES OF NANO MATERIALS: Microstructure and Defects in Nano crystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations. Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

UNIT III

SYNTHESIS ROUTES: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method, Self-assembly. Top down approaches: Mechanical alloying, Nano-lithography. Consolidation of Nano powders: Shock wave consolidation, Hot iso-static pressing and Cold iso-static pressing, Spark plasma sintering.

UNIT IV

TOOLS TO CHARACTERIZE NANOMATERIALS: X-Ray Diffraction (XRD), Small Angle X-ray scattering, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP),Nano indentation

UNIT V

APPLICATIONS OF NANO MATERIALS: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS),Nano sensors, Nano catalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water-Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defense and Space Applications, Concerns and challenges of Nanotechnology.

Text Book:

1) Introduction to Nano Technology by Charles. P. Poole Jr& Frank J. Owens.Wiley India Pvt. Ltd.
2) Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.
3) Nano Essentials- T.Pradeep/TMH.

REFERENCE BOOKS:

1. Solid State physics by Pillai, Wiley Eastern Ltd.
2. Introduction to solid state physics 7th edition by Kittel. John Wiley & sons (Asia) Pvt Ltd.

III B.TECH I SEMESTER

Course Code:

THERMAL MANAGEMENT OF ELECTRONIC SYSTEMS (OPEN ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To understand the basics of heat transfer and analyze heat transfer through fins
2) To understand the basics of convection and radiation modes of heat transfer.
3) To gain knowledge about the thermal analysis of printed circuit boards and their cooling.
4) To understand the principles of two-phase cooling and heat pipes.
5) To gain knowledge about the thermoelectric coolers.

Course Outcomes	
Upon successful completion of the course, the student will be able to:	
CO1	Apply the basics of heat transfer and analyze heat transfer through fins
CO2	Analyze the basics of convection and radiation modes of heat transfer.
CO3	Analyze knowledge about the thermal analysis of printed circuit boards and their cooling.
CO4	Explain the principles of two-phase cooling and heat pipes.
CO5	Justify knowledge about the thermoelectric coolers.

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

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

UNIT I

Introduction of Heat Transfer and Conduction: Modes – Conduction, Convection and Radiation – Basic Laws – Applications of Heat Transfer

Basics of Conduction –Conduction equation – Thermal analogy – Lumped heat capacity analysis - Heat conduction with phase change - Thermal Resistance – Extended Surfaces – Uniform cross section fins – Fin efficiency – Selection and design of fins.

UNIT II

Convection and Radiation: Forced and Free Convection – Heat transfer coefficient - Parameters effecting heat transfer – Thermal Properties of fluids - Combined Modes

Radiation – Stefan- Boltzmann Law – Kirchoff's law and Emissivity – Radiation between Black Isothermal Surfaces – Radiation between Grey Isothermal Surfaces – Extreme Climatic conditions - Radiation at normal ambient. Temperature measurement and its Instrumentation.

UNIT III

Printed Circuit Boards and Cooling – Chip packaging – thermal Resistance – Board Cooling methods – Board thermal Analysis – Equivalent thermal Conductivity

Air Cooling – Fans – Heat transfer Enhancement – Air handling systems – Blowers.

Single Phase Cooling – Coolant Selection – Natural Convection – Forced Convection – Air Cooling - Convective cooling in Small systems – Forced cooling in medium and large systems – Liquid cooling in high power modules – Case Studies.

UNIT IV

Two Phase Cooling and Heat pipes – Direct Immersion Cooling – Basics of Pool Boiling – Enhancement of Pool Boiling – Flow Boiling

Heat Pipes – Operation Principles – Useful Characteristics – Operating Limits and Temperatures – Operation Methods – Applications – Micro Heat Pipes.

UNIT V

Thermo Electric coolers: Basics theories – Thermo electric effect – Operation Principles Phase change materials, Thermal Interface materials, Heat Spreaders and Heat Sinks – Working Principles, Mini and Micro Channels. Use of nano fluids in electronic cooling.
Text Book: 1. Thermal Analysis and Control of Electronic Equipment – Allan D. Kraus and Avram BarCohen, McGraw Hill, New York, NY, 1983. 2. Fundamentals of Microelectronics Packaging – Ed: Rao Tummala, McGraw Hill, New York, NY, 2001.
REFERENCE BOOKS:
1) Packaging of Electronic Systems – James W. Dally, McGraw Hill, New York, NY, 1990.

III B.TECH I SEMESTER

Course Code:
FINITE ELEMENT METHODS
(PROFESSIONAL ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To understand the basic principles of finite element methods.
2) To understand discretization principles and apply to analyse the trusses.
3) To apply the finite element method to analyze and solve beam problems.
4) To gain knowledge about two dimensional stress analysis.
5) To understand and apply steady state analysis and dynamic analysis.

Course Outcomes

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

CO1	Apply basic principles of finite element methods.
CO2	Analyze about discretization principles and apply to analyse the trusses.
CO3	Apply the finite element method to analyze and solve beam problems.
CO4	Judge the knowledge about two dimensional stress analysis.
CO5	Apply steady state and dynamic analysis.

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

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

UNIT I

Finite Element Methods: Introduction to finite element method, stress and equilibrium, strain – displacement relations, stress–strain relations, plane stress and plane strain conditions, variational

and weighted residual methods, concept of potential energy, one dimensional problems.
UNIT II
Discretization: Bar element formulation, Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions. **Analysis of Trusses**: Finite element modeling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations
UNIT III
Analysis of Beams: Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.
UNIT IV
Finite element modeling: Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axi-symmetric problems. **Higher order and iso-parametric elements**: One dimensional, quadratic and cubic elements in natural coordinates, two dimensional four node iso-parametric elements and numerical integration.
UNIT V
Steady state heat transfer analysis: One dimensional analysis of a fin. **Dynamic Analysis**: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.
Text Book: 1) The Finite Element Methods in Engineering /S.S.Rao /Pergamon. 2) Introduction to Finite Elements in Engineering, Second Edition/ Tirupati Reddy Chandrupatla/ Prentice-Hall.
REFERENCE BOOKS:
1) Finite Element Method with applications in Engineering / YM Desai, Eldho & Shah /Pearson publishers 2) An introduction to Finite Element Method /JNReddy/McGraw-Hill 3) The Finite Element Method for Engineers–Kenneth H. Huebner, Donald L. Dewhirst, DouglasE. Smith andTed G. By rom/John Wiley & sons (ASIA) Pvt Ltd. 4) Finite Element Analysis: Theory and Application with Ansys, Saeed Moaveniu, Pearson Education 5) Finite Element Analysis: for students & Practicing Engineers / G.Lakshmi Narasaiah.

III B.TECH I SEMESTER

Course Code:

INDUSTRIAL ROBOTICS

(PROFESSIONAL ELECTIVE-I)

Lecture – Practical:	3-0 Hours	**Internal Marks:**	30
Credits	3	**External Marks:**	70
Prerequisites: None			
Course Objectives			

1) To understand the concepts of robotics and its systems.
2) To gain knowledge about the motion analysis and manipulator kinematics.
3) To understand the differential transformations.
4) To understand the basics about path description and generation.
5) To acquire knowledge about the actuators, feedback components and robotic applications.

Course Outcomes

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

CO1	Perceive the concepts of robotics and its systems.
CO2	Apply knowledge about the motion analysis and manipulator kinematics.
CO3	Analyze the differential transformations.
CO4	Apply the basics about path description and generation.
CO5	Judge about the actuators, feedback components and robotic 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					1					2	
CO2	2		3								1	
CO3		3	2		1							
CO4		2	3									1
CO5	2				3						1	

UNIT I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An overview of Robotics – present and future applications – classification by coordinate system and control system.
COMPONENTS OF THE INDUSTRIAL ROBOTICS: Robot anatomy, work volume, components, number of degrees of freedom - robot drive systems, function line diagram representation of robot arms, common types of arms –requirements and challenges of end effectors, determination of the end effectors, comparison of Electric, Hydraulic and Pneumatic types of actuation devices.

UNIT II

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.
MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics–problems

UNIT III

DIFFERENTIAL TRANSFORMATION: Jacobians – problems, robot dynamic arm dynamics: Lagrange –Euler and Newton – Euler formulations–Problems – generalized D – Alembert's Equation of motion.

UNIT IV

GENERAL CONSIDERATIONS IN PATH DESCRIPTION AND GENERATION: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion –Robot programming, languages and software packages-description of paths with a robot programming language.

UNIT V

ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors–potentiometers, resolvers, encoders–Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer - Material handling, loading and unloading- Processing -spot and continuous arc welding &spray painting- Assembly and Inspection.
Text Book: 1) Industrial Robotics / Groover MP /Pearson Edu. 2) Robotics and Control /Mittal R K & Nagrathi J /TMH. .
REFERENCE BOOKS:
1) Robotics/Fu KS/ McGraw-Hill. 2) Robotic Engineering /Richard D. Klafter, Prentice Hall 3) Robot Analysis and Control/ H. Asada and J.J.E. Slotine /BSP Books Pvt.Ltd. 4) Introduction to Robotics/John JCraig/Pearson Edu.

III B.TECH I SEMESTER

Course Code:
ADVANCED MATERIALS
(PROFESSIONAL ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To gain knowledge about the metals and alloys and their utility in different environments.
2) To acquire knowledge about polymers and ceramics and their applications.
3) To analyze composite materials along with reinforcements and their applications.
4) To understand the basics of shape memory alloys and functionally graded materials.
5) To gain knowledge about the nanomaterials and their applications.

Course Outcomes

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

CO1	Justify the knowledge about metals and alloys and their utility in different environments.
CO2	Judge about polymers and ceramics and their applications.
CO3	Analyze composite materials along with reinforcements and their applications.
CO4	Utilize shape memory alloys and functionally graded materials for different applications.
CO5	Justify about the nanomaterials and their 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	√	√	√	√								√
CO2	√	√	√	√								√
CO3	√	√	√	√								√
CO4	√	√	√	√								√

CO5	√	√	√	√								√

UNIT I

METALS & ALLOYS: Metallic materials- super alloys, Aluminium, Magnesium, titanium and Nickel based alloys and inter-metallics, Materials for cryogenic application, Materials for space environment, Evaluation of materials for extreme environment, Introduction to metallic foams.

UNIT II

POLYMERS: Natural Polymers-Synthetic polymers- Chemical & Physical structure, properties-glass-transition temperature-Thermosets-Thermoplastics- characteristics & applications of polymers-Elastomers- Processing of plastics.

CERAMICS: Applications-characteristics- classification-Processing of ceramics- Powder preparations- consolidation- hot compaction-drying- sintering-finishing of ceramics-Areas of application.

UNIT III

COMPOSITE MATERIALS: Introduction, classification: polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon–carbon composites, fiber- reinforced composites and nature-made composites, and applications

REINFORCEMENTS: Fibers- glass, silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers.

UNIT IV

SHAPE MEMORY ALLOYS: Introduction-shape memory effect-classification of shape memory alloys-composition-properties and applications of shape memory alloys.

FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials-classification different systems-preparation-properties and applications of functionally graded materials.

UNIT V

NANO MATERIALS: Introduction-properties at nano scales-advantages & disadvantages applications in comparison with bulk materials (nano–structure, wires, tubes, composites).

Text Book:

1) Nanomaterial /A.K. Bandyopadyay/New age Publishers.
2) Material science and Technology: A comprehensive treatment/Robert W.Cahn, /VCH.
3) Engineering Mechanics of Composite Materials / Isaac and M Daniel/Oxford University Press.

REFERENCE BOOKS:

1) Mechanics of Composite Materials / R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2) Analysis of Laminated Composite Structures / L. R. Calcote/Van Nostrand Rainfold,NY 1969.
3) Analysis and performance of fibre Composites /B. D. Agarwal and L. J. Broutman/Wiley-Inter science, New York, 1980.
4) Mechanics of Composite Materials - Second Edition (Mechanical Engineering) /Autar K.Kaw /CRC Press.

III B.TECH I SEMESTER

Course Code:

RENEWABLE ENERGY SOURCES
(PROFESSIONAL ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To demonstrate the importance of solar energy collection and storage.
2) To understand the wind energy principles.
3) To gain knowledge on biomass energy.
4) To know the principles of tidal energy.
5) To understand the concepts of geothermal energy.

Course Outcomes

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

CO1	Explain the importance of, solar energy collection and storage.
CO2	Discuss the wind energy principles.
CO3	Analyze about biomass energy concepts.
CO4	Apply the principles of tidal energy.
CO5	Utilize the concepts of geothermal energy.

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

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

UNIT I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT II

WIND ENERGY: Introduction, History of Wind Energy, Wind Energy Scenario of World and India. Basic principles of Wind Energy Conversion Systems (WECS), Types and Classification of WECS, Parts of WECS, Power, torque and speed characteristics, Electrical Power Output and Capacity Factor of WECS, Stand alone, grid connected and hybrid applications of WECS, Economics of wind energy utilization, Site selection criteria, Wind farm, Wind rose diagram.

UNIT III

BIOMASS ENERGY: Photosynthesis process, Biomass fuels, Biomass energy conversion

technologies and applications, Urban waste to Energy Conversion, Biomass Gasification, Types and application of gasifier, Biomass to Ethanol Production, Biogas production from waste biomass, Types of biogas plants, Factors affecting biogas generation, Energy plantation, Environmental impacts and benefits, Future role of biomass , Biomass programs in India.
UNIT IV
TIDAL ENERGY: Introduction, Capacity and Potential, Principle of Tidal Power, Components of Tidal Power Plant, Classification of Tidal Power Plants. Ocean Thermal Energy: Introduction, Ocean Thermal Energy Conversion (OTEC), Principle of OTEC system, Methods of OTEC power generation.
UNIT V
GEOTHERMAL ENERGY: Introduction, vapor and liquid dominated systems, binary cycle, hot dry rock resources, magma resources, advantages and disadvantages, applications, MHD Power generation: concept and working principle, Environmental impacts, Economic and social considerations, Financing mechanisms, Carbon credits, clean development mechanisms.
Text Book: 1) Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH. 2) Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006. 3) Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013.
REFERENCE BOOKS:
1) Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New Age international. 2) Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth & John F Kreider /Taylor & Francis. 3) Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd. 4) Renewable Energy Technologies -Ramesh & Kumar /Narosa. 5) Non-conventional Energy Source- G.D Roy/Standard Publishers. 6) Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt.Ltd. 7) Fuel Cell Technology -Hand Book / Gregor Hoogers / BSP Books Pvt. Ltd.

III B.TECH I SEMESTER

Course Code:
MECHANICS OF COMPOSITES
(PROFESSIONAL ELECTIVE-I)

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

Prerequisites: None

Course Objectives

1) To understand about the composite materials and their classification.
2) To illustrate micro mechanical analysis of a lamina.
3) To gain knowledge about the two dimensional angle lamina.
4) To illustrate macro mechanical analysis of a lamina.
5) To gain knowledge in designing the laminates.

Course Outcomes

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

CO1	Discuss the composite materials and their classification.

CO2	Apply the micro mechanical analysis of a lamina.
CO3	Explain about two dimensional angle lamina
CO4	Apply the macro mechanical analysis of a lamina.
CO5	Utilize knowledge in designing the laminates.

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

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

UNIT I

INTRODUCTION TO COMPOSITES: Composites, materials- matrix and reinforcement, Particulate composites, rule of mixtures, classification of composites, Applications

UNIT II

MICRO MECHANICAL ANALYSIS OF A LAMINA :Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi-Empirical Models ,Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion

UNIT III

HOOKE'S LAW FOR A TWO-DIMENSIONAL ANGLE LAMINA: Engineering Constants of an Angle Lamina, Invariant form of Stiffness and Compliance Matrices for an Angle Lamina Strength

Hygro-thermal Stresses and Strains in a Lamina: Hygro-thermal Stress–Strain relationships for a Unidirectional Lamina, Hygro-thermal Stress–Strain Relationships for an Angle Lamina

UNIT IV

MACRO MECHANICAL ANALYSIS OF A LAMINA: Introduction, Definitions: Stress, Strain, Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina, Laminate Code , Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate ; Hygro-thermal Effects in a Laminate, warpage of Laminates.

UNIT V

DESIGN OF LAMINATES: Introduction, thin plate theory, specially orthotropic plate, cross and angle ply laminated plates, problems using thin plate theory, Failure theories, Design of Laminated Composites.

Text Book:

1) Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press,

1994.
2) B. D. Agarwal and L. J. Broutman, Analysis and performance of fiber Composites,Wiley-Interscience, New York, 1980.
3) Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw, CRC press.

REFERENCE BOOKS:

1) R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
2) L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

III B.TECH I SEMESTER

Course Code:
MACHINE TOOLS LAB

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

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

1) To understand general purpose machine tools in the machine shop.
2) To demonstrate various operations on lathe machine.
3) To demonstrate different operations on drilling machine.
4) To demonstrate basic operations on shaping machine.
5) To demonstrate the making of keyways on slotting machine.
6) To demonstrate the basic operations on milling machine.

Course Outcomes:

CO1	Demonstrate about general purpose machine tools in the machine shop.
CO2	Explain various operations on lathe machine.
CO3	Distinguish between different operations on drilling machine.
CO4	Experiment with basic operations on shaping machine.
CO5	Utilize slotting machine to make keyways.
CO6	Experiment with the basic operations on 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	√	√	√									√
CO2	√	√	√									√
CO3	√	√	√									√
CO4	√	√	√									√
CO5	√	√	√									√
CO6	√	√	√									√

List of Experiments

1) Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper, Planing machine, Slotting machine, Cylindrical grinder, Surface grinder and Tool and cutter grinder. 2) Operations on Lathe machine a) Step turning and Knurling b) Taper turning and Knurling c) Thread cutting and knurling d) Drilling and tapping 3) Operations on Drilling machine a) Drilling, reaming and tapping b) Rectangular drilling c) Circumferential drilling 4) Operations on Shaping machine a) Round to square b) Round to Hexagonal 5) Operations on Slotter a) Keyway (T–slot) b) Keyway cutting 6) Operations on milling machines a) Indexing b) Gear manufacturing
TEXT BOOKS:
1. Department Manual.
REFERENCE BOOKS:

III B.TECH I SEMESTER

Course Code:
THERMAL ENGINEERING LAB

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

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

1) To demonstrate the characteristics of two stroke and four stroke compression and spark ignition engines.
2) To determine flash point, fire point, calorific value of different fuels using various apparatus.
3) To determine engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines.
4) To demonstrate speed test, performance test and cooling temperature on petrol and diesel engines.
5) To demonstrate performance test and determine efficiency of air compressor.
6) To understand the principles through assembly and disassembly of 2/3 wheelers, 2/4 stroke

engines, tractor, heavy duty engines and boilers and their mountings and accessories.

Course Outcomes:	
CO1	Experiment with two stroke and four stroke compression and spark ignition engines for various characteristics.
CO2	Perceive flash point, fire point, calorific value of different fuels using various apparatus.
CO3	Identify engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines.
CO4	Categorize speed test, performance test and cooling temperature on petrol and diesel engines.
CO5	Utilize air compressor for its performance test and to determine efficiency.
CO6	Discuss the principles through assembly and disassembly of 2/3 wheelers, 2/4 stroke engines, tractor, heavy duty engines, boilers and their mountings and accessories.

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

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

List of Experiments

1. To determine the actual Valve Timing diagram of a four stroke Compression/Spark Ignition Engine.
2. To determine the actual Port Timing diagram of a two stroke Compression/Spark Ignition Engine.
3. Determination of Flash & Fire points of Liquid fuels / Lubricants using (i) Abels Apparatus; (ii) Pensky Martin's apparatus and (iii) Cleveland's apparatus.
4. Determination of Viscosity of Liquid lubricants/Fuels using (i) Saybolt Viscometer and (ii) Redwood Viscometer.
5. Determination of Calorific value of Gaseous Fuels using Junkers Gas Calorimeter.
6. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol/diesel engine.
7. Evaluation of Engine Friction by Motoring/Retardation Test on a Single Cylinder 4 Stroke Petrol/Diesel Engine.
8. To perform the Heat Balance Test on Single Cylinder four Stroke Petrol/Diesel Engine.
9. Determination of Air/Fuel Ratio and Volumetric Efficiency on a four Stroke Petrol/Diesel Engine.
10. To conduct a load test on a single cylinder Petrol/Diesel engine to study its performance under various loads.
11. To determine the optimum cooling temperature of a Petrol/Diesel engine.
12. To conduct economical speed test on a four stroke Petrol/Diesel engine.
13. To conduct a performance test on a VCR engine, under different compression ratios and

determine its heat balance sheet. 14. To conduct a performance test on an air compressor and determine its different efficiencies. 15. Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines.Study of Boilers with mountings and accessories.
TEXT BOOKS:
1. Department Manual
REFERENCE BOOKS:

III B.TECH I SEMESTER

Course Code:
ADVANCED COMMUNICATION SKILLS LAB

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

Prerequisites: NIL

Course Objectives:

1. To improve students' fluency in spoken English
2. To enable them to listen to English spoken at normal conversational speed
3. To help students develop their vocabulary
4. To read and comprehend texts in different contexts
5. To communicate their ideas relevantly and coherently in writing
6. To make students industry-ready
7. To help students acquire behavioural skills for their personal and professional life
8. To respond appropriately in different socio-cultural and professional contexts

Course Outcomes:

CO1	Recall vocabulary and use it contextually
CO2	Interpret listen and speak effectively
CO3	Develop proficiency in academic reading and writing
CO4	Develop the possibilities of job prospects

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

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

List of Experiments

1. **Inter-personal Communication and Vocabulary Building** - Starting a Conversation – Responding Appropriately and Relevantly – Role Play in Different Situations - Synonyms and Antonyms, One- word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

2. **Reading Comprehension and Listening Skills** –General Vs Local Comprehension, Techniques- Reading for Facts, Guessing Meanings from Context, Skimming, Scanning, Inferring Meaning-Listening Comprehension(Video/Audio talks)

3. **Technical Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing- Circular writing/ Meeting agenda/ Minutes of Meeting.

4. **Presentation Skills** – Public speaking-Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments… etc.,- Stage dynamics- Body Language- Para Language.

5. Getting Ready for the Job:

a. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

b. Soft Skills: Inter and Intra Personal Skills.

TEXT BOOKS:

REFERENCE BOOKS:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press2009.

2. Technical Communication by Paul V.Anderson.2007. Cengage Learning pvt. Ltd. NewDelhi.

3. Business and Professional Communication: Keys for Workplace Excellence .Kelly M. Quintanilla& ShawnT.Wahl. SageSouth AsiaEdition. SagePublications.2011.

4. The Basics of Communication: A Relational Perspective. Steve Duck & David T.McMahan. Sage South AsiaEdition.SagePublications.2012.

5. English Vocabulary in Use series, CambridgeUniversityPress2008.

6. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad2008.

7. Handbook for Technical Communication by David A.McMurrey & Joanne Buckley.2012.

8. Handbook for Technical Writing by David A McMurrey & JoanneBuckely CENGAGE Learning 2008.

9. Job Hunting by Colm Downes, Cambridge University Press2008.

10. Master Public Speaking by Anne Nicholls, JAICOPublishingHouse,2006.

11. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

12. Books on TOEFL/GRE/GMAT/CAT/IELTS/SAT by Barron's/DELTA/Cambridge University Press.

13. The Definitive Book of body Language – by Allan Pease, Barbara Pease.

III B.TECH I SEMESTER

Course Code:

PROFESSIONAL ETHICS AND HUMAN VALUES

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

Prerequisites: None

Course Objectives

1) To understand the concepts of human values.
2) To gain knowledge about the principles of engineering ethics.
3) To interpret engineering as social experimentation.
4) To understand engineers' responsibility for safety and risk.
5) To gain knowledge about the engineers' rights and responsibilities.

Course Outcomes

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

CO1	Judge the concepts of human values.
CO2	Justify knowledge about the principles of engineering ethics.
CO3	Interpret engineering as social experimentation.
CO4	Utilize engineers' responsibility for safety and risk.
CO5	Develop about the engineers' rights and responsibilities.

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

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

UNIT I

HUMAN VALUES: Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing –Honesty –Courage – Value time – Co-operation – Commitment – Empathy –Self-confidence – Spirituality- Character.

UNIT II

ENGINEERING ETHICS:
The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer – Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics-Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma.

UNIT III

ENGINEERING AS SOCIAL EXPERIMENTATION:
Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

UNIT IV

ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK:
Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for

Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.
UNIT V
ENGINEERS' RESPONSIBILITIES AND RIGHTS: Collegiality-Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty-misguided Loyalty – professionalism and Loyalty-Professional Rights –Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self-interest, Customs and Religion- Ethical egoism-Collective bargaining-Confidentiality-Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational Crimes-industrial espionage-price fixing-endangering lives-Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.
Text Book: 1) Engineering Ethics and Human Values by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009. 2) Professional Ethics and Morals by Prof.A.R.Aryasri, Dharanikota, Suyodhana-Maruthi Publications.
REFERENCE BOOKS:
1) Professional Ethics and Human Values by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-Laxmi Publications. 2) Professional Ethics and Human Values by Prof. D. R. Kiran, TMH. 3) Indian Culture, Values and Professional Ethics by P.S.R. Murthy-BS Publication. 4) Ethics in Engineering by Mike W. Martin and Roland Schinzinger– Tata McGraw-Hill – 2003. 5) Engineering Ethics by Harris, Pritchard and Robins, CENGAGE Learning, Indian Edition, 2009.

III B.TECH II SEMESTER

Course Code:
HEAT TRANSFER

Lecture – Practical:	3-0 Hours	**Internal Marks:**	30
Credits	3	**External Marks:**	70
Prerequisites: None			
Course Objectives			
1) To gain knowledge about mechanism and modes of heat transfer. 2) To understand the concepts of conduction and convective heat transfer. 3) To gain knowledge about the forced and free convection. 4) To understand the concepts of heat transfer with phase change and condensation along with heat exchangers. 5) To gain knowledge about radiation mode of heat transfer.			
Course Outcomes			
Upon successful completion of the course, the student will be able to:			
CO1	Apply knowledge about mechanism and modes of heat transfer.		
CO2	Understand the concepts of conduction and convective heat transfer.		
CO3	Illustrate about forced and free convection.		
CO4	Analyze the concepts of heat transfer with phase change and condensation along with heat		

	exchangers.
CO5	Build the knowledge about radiation mode of heat transfer.

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

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

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 rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation. Variable Thermal conductivity – systems with heat sources or Heat generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature.

UNIT II

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi-infinite body.

Convective Heat Transfer: Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham π Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations

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.

UNIT IV

Heat Transfer with Phase Change: Boiling: – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling

Condensation: Film wise and drop wise condensation –Nusselt's Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU

methods.
UNIT V
Radiation Heat Transfer: Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.
Text Book: 1) Heat Transfer by HOLMAN, Tata McGraw-Hill. 2) Heat Transfer by P.K.Nag, TMH.
REFERENCE BOOKS:
1) Fundamentals of Heat Transfer by Incropera& Dewitt, John Wiley. 2) Fundamentals of Engineering, Heat& Mass Transfer by R.C.Sachdeva, NewAge. 3) Heat& Mass Transfer by Amit Pal – Pearson Publishers. 4) Heat Transfer by Ghoshadastidar, Oxford University press. 5) Heat Transfer by a Practical Approach, YunusCengel, Boles, TMH. 6) Engineering Heat and Mass Transfer by Sarit K. Das, DhanpatRai Pub

III B.TECH II SEMESTER

Course Code:
DESIGN OF MACHINE MEMBERS-II

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

Prerequisites: None

Course Objectives

1) To gain knowledge about the design of bearings.
2) To understand the concepts in designing various engine parts.
3) To gain knowledge to design curved beams and power screws.
4) To understand power transmission systems and to design pulleys and gear drives.
5) To understand the concepts in designing various machine tool elements.

Course Outcomes

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

CO1	Apply knowledge about the design of bearings.
CO2	Explain the concepts in designing various engine parts.
CO3	Utilize the knowledge to design curved beams and power screws.
CO4	Justify power transmission systems and to design pulleys and gear drives.
CO5	Apply the concepts in designing various machine tool elements.

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

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

CO2	√	√	√	√	√							√
CO3	√	√	√	√	√							√
CO4	√	√	√	√	√							√
CO5	√	√	√	√	√							√

UNIT I

BEARINGS: Classification of bearings- applications, types of journal bearings – lubrication – bearing modulus – full and partial bearings – clearance ratio – heat dissipation of bearings, bearing materials – journal bearing design – ball and roller bearings – static loading of ball & roller bearings, bearing life.

UNIT II

ENGINE PARTS: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – cranks and crank shafts, strength and proportions of over hung and center cranks – crank pins, crank shafts.

Pistons, forces acting on piston – construction design and proportions of piston, cylinder, cylinder liners,

UNIT III

DESIGN OF CURVED BEAMS: introduction, stresses in curved beams, expression for radius of neutral axis for rectangular, circular, trapezoidal and t-section, design of crane hooks, c –clamps.

DESIGN OF POWER SCREWS: Design of screw, square ACME, buttress screws, design of nut, compound screw, differential screw, ball screw- possible failures.

UNIT IV

POWER TRANSMISSIONS SYSTEMS, PULLEYS: Transmission of power by belt and rope drives, transmission efficiencies, belts – flat and V types – ropes - pulleys for belt and rope drives, materials, chain drives

SPUR & HELICAL GEAR DRIVES: Spur gears- helical gears – load concentration factor – dynamic load factor, surface compressive strength – bending strength – design analysis of spur gears – estimation of centre distance, module and face width, check for plastic deformation, check for dynamic and wear considerations.

UNIT V

MACHINE TOOL ELEMENTS: Levers and brackets: design of levers – hand levers-foot lever – cranked lever – lever of a lever loaded safety valve- rocker arm straight – angular- design of a crank pin – brackets- hangers- wall boxes.

Wire Ropes: Construction, Designation, Stresses in wire ropes, rope sheaves and drums.

Text Book:

1. Machine Design/V. Bhandari/TMH Publishers
2. Machine Design/NC Pandya & CS Shaw/ Charotar publishers

REFERENCE BOOKS:

1. Machine Design: An integrated Approach / R.L. Norton / Pearson Education
2. Mech. Engg. Design / JE Shigley/Tata McGraw Hill education
3. Design of machine elements- spots/Pearson Publications
4. Machine Design-Norton/Pearson Publications.

III B.TECH II SEMESTER

Course Code:

Introduction to CAD/CAM

Lecture – Practical:	3-0 Hours	**Internal Marks:**	30

Credits	3	External Marks:	70

Prerequisites: Students are expected to have knowledge on:

1. Computer peripherals like Input and output devices
2. Various display devices, representation methods & Transformations in the Computer Graphics
3. commands used for 2D & 3D drawings in the AutoCAD software
4. Interactive Computer Graphics

Metal Cutting and Machine Tools

Course Objectives

1. To impart fundamentals of computer aided design and manufacturing.
2. To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.,
3. To understand the fundamentals used to create and manipulate geometric models
4. To get acquainted with the basic CAD software designed for geometric modeling
5. To learn working principles of NC machines, CNC control and part programming & DNC
6. To understand concept of Group Technology, FMS and CIM and interpret the importance of CAQC.

Course Outcomes

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

CO1	Demonstrate basic structure of CAD workstation, Memory types, input/output devicesand display devices and computer graphics
CO2	Make use of knowledge of geometric modeling and execute the steps required inCAD software for developing 2D &3D models and perform transformations
CO3	understand the construction of database models and geometric modeling features
CO4	understand how to write the part programs for different models by using part programming
CO5	explain features of Group Technology (GT), CAPP & FMS and illustrate CAQC and CIM concepts

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

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

UNIT I

Computers in industrial manufacturing, product cycle, CAD / CAM Hardware, basic structure, CPU, memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS: Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal

GEOMETRIC MODELING: Requirements, geometric models, geometric construction models,

curve representation methods, surface representation methods, modeling facilities desired.

UNIT II

DRAFTING AND MODELING SYSTEMS: Basic geometric commands, layers, display control commands, editing, dimensioning and solid modeling.

PART PROGRAMMING FOR NC MACHINES: NC, NC modes, NC elements, CNC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming. Direct Numerical Control

UNIT III

GROUP TECHNOLOGY: Part family, coding and classification, production flow analysis, types and advantages. Computer aided processes planning – importance, types.

FMS: Introduction, Equipment, Tool management systems, Layouts, FMS Control

UNIT IV

COMPUTER AIDED QUALITY CONTROL: Terminology used in quality control, use of computers in Quality control. Inspection methods- contact and noncontact types, computer aided testing, integration of CAQC with CAD/CAM

UNIT V

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Types of manufacturing systems, machine tools and related equipment, material handling systems, material requirement planning, computer control systems, human labour in manufacturing systems, CIMS benefits.

Text Book:

1. CAD/CAM: Principles and Applications: Rao P N, Tata McGraw Hill Higher Education P Ltd 2002
2. CAD/CAM: Groover, Mikell P and Zimmer's Emory W, Prentice Hall India (P) Ltd, 2001
3. CAD/CAM/CIM: Radhakrishnan P, New Age International Publishers 1994

REFERENCE BOOKS:

1. Mastering CAD / CAM / Ibrahim Zeid / McGraw-Hill
2. Principles of Computer Aided Design and Manufacturing / FaridAmirouche / Pearson
3. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson learning, Inc
4. Product manufacturing and cost estimation using CAD/CAE/ KuangHua Chang/Elsevier Publishers
5. CAD/CAM Concepts & applications/Alavala/PHI

III B.TECH II SEMESTER

Course Code:

AUTOMOBILE ENGINEERING

(PROFESSIONAL ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand various components of four wheeler automobile.
2) To gain knowledge of different parts of transmission system.
3) To understand the concepts of steering and suspension systems.
4) To gain knowledge about the braking system and electrical system used in automobiles.

5) To understand the concepts about engine specifications and service, safety and electronic system used in automobiles.

Course Outcomes

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

CO1	Illustrate various components of four wheeler automobile.
CO2	Apply the knowledge of different parts of transmission system.
CO3	Judge about steering and suspension systems.
CO4	Justify the braking system and electrical system used in automobiles.
CO5	Analyze the concepts about engine specifications and service, safety and electronic system used in automobiles.

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

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

UNIT I

INTRODUCTION: Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarbonisation, Nitriding of crank shaft.

UNIT II

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres and their making.

UNIT III

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toein, centre point steering. types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

UNIT IV

BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes.

ELECTRICAL SYSTEM: Charging circuit, generator, current – voltage regulator – starting system, Bendix drive mechanism solenoid switch, lighting systems, horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

UNIT V

ENGINE SPECIFICATION AND SAFETY SYSTEMS: Introduction- engine specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc.

SAFETY: Introduction, safety systems - seat belt, air bags, bumper, anti-lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.

ENGINE SERVICE: Introduction, service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions.

AUTOMOBILE ELECTRONIC SYSTEMS:

Concept of CPU and computer memory used in automobiles, sensors- Pressure sensor, Throttle position sensor, fuel flow sensor, thermistor sensor, oxygen sensor, speed sensors, knock detecting sensor, actuators solenoids and stepper motor, Electronic dash board instruments - Onboard diagnosis system, security and warning system.

Text Book:

1) Automotive Mechanics – Vol. 1 & Vol. 2 / Kirpal Singh/standard publishers
2) Automobile Engineering / William Crouse/TMH Distributors
3) Automobile Engineering/P.S Gill/S.K. Kataria& Sons/New Delhi.

REFERENCE BOOKS:

1) Automotive Engines Theory and Servicing/James D. Halderman and Chase D. Mitchell Jr.,/ Pearson education inc.
2) Automotive Engineering / K Newton, W.Steeds& TK Garrett/SAE
3) Automotive Mechanics: Principles and Practices/ Joseph Heitner/Van Nostrand Reinhold 4. Automobile Engineering / C Srinivasan/McGraw-Hill.

III B.TECH II SEMESTER

Course Code:

SMART MANUFACTURING

(PROFESSIONAL ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand concepts of smart manufacturing.
2) To gain knowledge about smart machines and sensors.
3) To understand the principles of IoT connectivity to industry 4.0.
4) To acquire knowledge about digital twin and its applications and machine learning and artificial intelligence in manufacturing.
5) To understand the basic concepts of metaverse.

Course Outcomes

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

CO1	Apply the basic concepts of smart manufacturing.
CO2	Analyze about smart machines and sensors.

CO3	Utilize the principles of IoT connectivity to industry 4.0.
CO4	Distinguish between digital twin and its applications and machine learning and artificial intelligence in manufacturing.
CO5	Demonstrate the basic concepts of metaverse.

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

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

UNIT I

Concepts of Smart Manufacturing: Definition and key characteristics of smart manufacturing, Corporate adaptation processes, manufacturing challenges, challenges vs technologies, Stages in smart manufacturing. Minimizing Six big losses in manufacturing with Industry 4.0, and their benefits

UNIT II

Smart Machines and Smart Sensors: Concept and Functions of a Smart, Machine Salient features and Critical Subsystems of a Smart Machine, Smart sensors; smart sensors ecosystem, need, benefits and applications of sensors in industry, Introduction to IoT, IIoT, and Cyber physical systems, Sensing for Manufacturing Process in IIoT, Block Diagram of an IoT Sensing Device, Sensors in IIoT Applications, Smart Machine Interfaces,

UNIT III

IoT connectivity for Industry 4.0: Industrial communication requirement and its infrastructure, an overview of different types of networks, mesh network in industrial IoT, IoT protocols and the internet, TCP/IP (transmission control protocol/internet protocol) model, IoT connectivity standards: common protocols, application layer protocols, internet/network layer protocols, physical layer IoT protocols, choosing the right IoT connectivity protocol.

UNIT IV

Digital Twin: Introduction, applications of digital twins, impact zones of digital twins in manufacturing (factories/plants and OEMs), advantages of digital twins, basic steps of digital twin technology

Machine Learning (ML) and Artificial Intelligence (AI) in Manufacturing: Introduction, benefits and applications of ML in industries, common approaches of ML; supervised and unsupervised, semi-supervised and reinforced ML.

UNIT V

Metaverse – Basic concepts, AR/VR, Social Metaverse, Industrial Metaverse, How Web 3.0 is changing the Internet, Asset Classes Inside the Metaverse, Land, Coins, Characters/ Avatars, Skins, Utility, Industries Disrupted by the Metaverse, Smart wearables,

Text Book:

1) Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2/e, Pearson

Education, 2010.
2) Tom M. Mitchell, Machine Learning, McGraw Hill, 2013.
3) Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press, 2004.
4) AurélienGéron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017.
5) Artificial Intelligence and Machine Learning, Principles and applications by Vinod Chandra S.S., Anand Hareendran S., PHI.

REFERENCE BOOKS:

1) Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
2) Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.
3) MACHINE LEARNING: A practitioner's approach, by Vinod Chandra S.S., Anand Hareendran S., PHI.
4) M.C. Trivedi, A Classical Approach to Artifical Intelligence, Khanna Publishing House,New Delhi, 2018.
5) S. Kaushik, Artificial Intelligence, Cengage Learning India, 2011.

III B.TECH II SEMESTER

Course Code:
ADVANCED MECHANICS OF SOLIDS
(PROFESSIONAL ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand the principles of failure criteria.
2) To determine the stresses and deflection in unsymmetrical bending of beams.
3) To gain knowledge about curved beam theory.
4) To understand concept about torsion.
5) To analyze the contact stresses.

Course Outcomes

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

CO1	Explain the principles of failure criteria.
CO2	Determine the stresses and deflection in unsymmetrical bending of beams.
CO3	Apply the knowledge about curved beam theory.
CO4	Interpret the concept of torsion.
CO5	Analyze the contact stresses.

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

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**

CO1	√	√	√	√	√							√
CO2	√	√	√	√	√							√
CO3	√	√	√	√	√							√
CO4	√	√	√	√	√							√
CO5	√	√	√	√	√							√

UNIT I

FAILURE CRITERIA: Modes of failure, Excessive deflections, Yield initiation, fracture, Progressive fracture, High Cycle fatigue for number of cycles N > 106, buckling. Concept of Creep. Application of energy methods: Elastic deflections and statically indeterminate members and structures: Principle of stationary potential energy, Castiglione's theorem on deflections, Castiglione's theorem on deflections for linear load deflection relations, deflections of statically determinate structures.

UNIT II

UNSYMMETRICAL BENDING: Bending stresses in Beams subjected to Non-symmetrical bending; Deflection of straight beams due to non-symmetrical bending.

UNIT III

CURVED BEAM THEORY: Winkler Bach formula for circumferential stress – Limitations – Correction factors –Radial stress in curved beams – closed ring subjected to concentrated and uniform loads-stresses in chain links.

UNIT IV

TORSION: Linear elastic solution; Prandtl elastic membrane (Soap-Film) Analogy; Narrow rectangular cross Section; Hollow thin wall torsion members, Multiply connected Cross Section.

UNIT V

CONTACT STRESSES: Introduction; problem of determining contact stresses; Assumptions on which a solution for contact stresses is based; Expressions for principal stresses; Method of computing contact stresses; Deflection of bodies in point contact; Stresses for two bodies in contact over narrow rectangular area (Line contact), Loads normal to area; Stresses for two bodies in line contact, Normal and Tangent to contact area.

Text Book:

1) Advanced Mechanics of materials by Boresi& Sidebottom-Wiley International.
2) Theory of elasticity by Timoshenko S.P. and Goodlier J.N. McGraw-Hill Publishers 3rdEdition.
3) Advanced Mechanics of Solids, L.S Srinath.

REFERENCE BOOKS:

1. Advanced strength of materials by Den Hortog J.P.
2. Theory of plates – Timoshenko.
3. Strength of materials & Theory of structures (Vol I & II) by B.C Punmia.
4. Strength of materials by Sadhu Singh.

III B.TECH II SEMESTER

Course Code:

STATISTICAL QUALITY CONTROL
(PROFESSIONAL ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand the concepts of quality systems and quality engineering in design and processes.
2) To acquire knowledge about the statistical process control charts and sampling techniques.
3) To analyze the loss function and quality function deployment.
4) To explore the models of reliability engineering.
5) To gain knowledge about the concepts of complex system and reliability engineering techniques.

Course Outcomes

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

CO1	Discuss the concepts of quality systems and quality engineering in design and processes.
CO2	Utilize knowledge about the statistical process control charts and sampling techniques.
CO3	Analyze the loss function and quality function deployment.
CO4	Judge the models of reliability engineering.
CO5	Apply knowledge about the concepts of complex system and reliability engineering techniques.

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

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

UNIT I

Quality value and engineering – quality systems – quality engineering in product design and production process – system design – parameter design – tolerance design, quality costs – quality improvement.

UNIT II

Statistical process control X , R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index. (SQC tables can be used in the examination) Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plans.

UNIT III

Loss function, tolerance design – N type, L type, S type; determination of tolerance for these types. Online quality control – variable characteristics, attribute characteristics, parameter design. Quality function deployment – house of quality, QFD matrix, total quality management concepts. Quality information systems, quality circles, introduction to ISO 9000 standards.

UNIT IV
Reliability – Evaluation of design by tests - Hazard Models, Linear, Releigh, Weibull. Failure Data Analysis, reliability prediction based on Weibull distribution, Reliability improvement.
UNIT V
Complex system, reliability, reliability of series, parallel & standby systems & complex systems & reliability prediction and system effectiveness. Maintainability, availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.
Text Book: 1. Quality Engineering in Production Systems / G Taguchi /McGraw Hill. 2. Reliability Engineering/ E.Bala Guruswamy/Tata McGraw Hill. 3. Statistical Quality Control: A Modern Introduction/ Montgomery/Wiley.
REFERENCE BOOKS:
1) Jurans Quality planning & Analysis/ Frank.M.Gryna Jr. / McGraw Hill. 2) Taguchi Techniques for Quality Engineering/ Philipposs/ McGraw Hill. 3) Reliability Engineering / LS Srinath / Affiliated East West Pvt. Ltd. 4) Statistical Process Control/ Eugene Grant, Richard Leavenworth / McGraw Hill. 5) Optimization & Variation Reduction in Quality / W.A. Taylor / Tata McGraw Hill. 6) Quality and Performance Excellence/ James R Evans/ Cengage learning

III B.TECH II SEMESTER

Course Code:
INDUSTRIAL HYDRAULICS AND PNEUMATICS
(PROFESSIONAL ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand the principles and laws of fluid power.
2) To explore the hydraulic and pneumatic elements and their accessories.
3) To analyze and design the hydraulic and pneumatic circuits.
4) To understand and apply the principles of hydraulic and pneumatic devices.
5) To gain knowledge about installation, maintenance and trouble shooting of hydraulic and pneumatic systems.

Course Outcomes

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

CO1	Discuss the principles and laws of fluid power.
CO2	Judge the hydraulic and pneumatic elements and their accessories.
CO3	Analyze and design the hydraulic and pneumatic circuits.
CO4	Apply the principles of hydraulic and pneumatic devices.
CO5	Analyze knowledge about installation, maintenance and trouble shooting of hydraulic and pneumatic 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	√	√	√									√
CO2	√	√	√									√
CO3	√	√	√									√
CO4	√	√	√									√
CO5	√	√	√									√

UNIT I

Fluid Power: Power transmission modes, hydraulic systems, pneumatic systems, laws governing fluid flow: Pascal's law, continuity equation, Bernoulli's theorem, Boyle's, Charles', Gay-Lussec' laws, flow through pipes - types, pressure drop in pipes, Working fluids used in hydraulic and pneumatic systems- types, ISO/BIS standards and designations, properties.

UNIT II

Hydraulic and Pneumatic Elements: Hydraulic pipes-Types, standards, designation methods and specifications, pressure ratings, applications and selection criteria, pumping theory, Hydraulic Pumps - types, construction, working principle, applications, selection criteria and comparison, hydraulic Actuators, Control valves, Accessories - their types, construction and working, pneumatic Pipes - materials, designations, standards, properties and piping layout, air compressors, Air receivers, air dryers, Air Filters, Regulators, Lubricators (FRL unit): their types, construction, working, specifications and selection criteria of following air preparation and conditioning elements, pneumatic Actuators and Control valves - types, construction, working, materials and specifications

UNIT III

Hydraulic and Pneumatic Circuits: ISO symbols used in hydraulic and pneumatic circuit, basic Hydraulic Circuits – types (such as intensifier, regenerative, synchronizing, sequencing, speed control, safety), circuit diagram, components, working and applications, basic Pneumatic Circuits – types (such as speed control, two step feed control, automatic cylinder reciprocation, time delay, quick exhaust), circuit diagram, components, working and applications, pneumatic Logic circuit design - classic method, cascade method, step counter method, Karnaugh- Veitch maps and combinational circuit design.

UNIT IV

Hydraulic and Pneumatic Devices: Hydraulic and Pneumatic devices – Concept and applications, construction, working principle, major elements, performance variables of: Automotive hydraulic brake, Industrial Fork lift, Hydraulic jack, Hydraulic press, Automotive power steering, Automotive pneumatic brake, Automotive air suspension, Pneumatic drill, Pneumatic gun.

UNIT V

Installation, Maintenance and Trouble-Shooting: Installation of hydraulic and pneumatic system causes and remedies for common troubles arising in hydraulic elements, maintenance of hydraulic systems, causes and remedies for troubles arising in pneumatic elements, maintenance of pneumatic systems.

Text Book: 1) Majumdar, S.R. Oil Hydraulic Systems Tata McGraw-Hill Publication, New Delhi,3/e, 2013. 2) Majumdar, S.R. Pneumatic Systems Tata McGraw-Hill Publication, New Delhi,3/e, 2013.
REFERENCE BOOKS:
1) Srinivasan, R. Hydraulic and Pneumatic Controls Vijay Nicole Imprints Private, New Delhi, Limited, 2/e, 2008. 2) Jagadeesha, T. Fluid Power Generation, Transmission and Control Universities Press (India) Private Limited, New Delhi,1/e, 2014. 3) Jagadeesha, T. Pneumatics Concepts, Design and Applications Universities Press (India) Private Limited, New Delhi,1/e, 2014. 4) Parr, Andrew Hydraulic and Pneumatics, A Technician's and Engineer's Guide, Jaico Publishing House, New Delhi,2/e, 2013. 5) Shanmuga Sundaram, K. Hydraulic and Pneumatics Controls - Understanding Made Easy S. Chand Company Ltd., New Delhi, 1/e, 2006.

III B.TECH II SEMESTER

Course Code:
INDUSTRIAL ROBOTICS
(OPEN ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand the basic concepts and components of industrial robotics and automation.
2) To acquire knowledge about robot actuators and feedback components.
3) To analyze the motion of robot and manipulator kinematics.
4) To know the general considerations of path description and generation.
5) To gain knowledge about the image processing, machine vision and robotic applications.

Course Outcomes

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

CO1	Explain the basic concepts and components of industrial robotics and automation.
CO2	Judge the knowledge about robot actuators and feedback components.
CO3	Analyze the motion of robot and manipulator kinematics.
CO4	Analyze the general considerations of path description and generation.
CO5	Utilize knowledge about the image processing, machine vision and robotic 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					1					2	
CO2	2		3								1	

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

UNIT I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An overview of Robotics –present and future applications – classification by coordinate system and control system.

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Robot anatomy, work volume, components, number of degrees of freedom - robot drive systems, functions, line diagram representation of robot arms,common types of arms –requirements and challenges of end effectors, determination of the end effectors.

UNIT II

ROBOT ACTUATORS AND FEEDBACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, electric& stepper motors. Comparison of Electric, Hydraulic and Pneumatic types of actuation devices.

Feedback components: position sensors–potentiometers, resolvers, encoders–Velocity sensors.

UNIT III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics–problems.

UNIT IV

GENERAL CONSIDERATIONS IN PATH DESCRIPTION AND GENERATION: Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion–straight line motion–Robot programming, languages and software packages-description of paths with a robot programming language.

UNIT V

IMAGE PROCESSING AND MACHINE VISION: Introduction to Machine Vision, Sensing and Digitizing function in Machine Vision, Training and Vision System, Robotic Applications.

Text Book:

1) Industrial Robotics/GrooverMP/Pearson Edu.
2) Robotics and Control /MittalR K & Nagrathi J /TMH.

REFERENCE BOOKS:

1) Robotics/Fu KS/ McGrawHill.
2) Robotic Engineering /Richard D. Klafter, PrenticeHal.l
3) Robot Analysis and Control/ H. Asada and J.J.E. Slotine/BSP Books Pvt.Ltd.
4) Introduction to Robotics/John JCraig/PearsonEdu.

III B.TECH II SEMESTER

Course Code:

ESSENTIALS OF MECHANICAL ENGINEERING (OPEN ELECTIVE-II)

Lecture – Practical:	3-0 Hours	**Internal Marks:**	30
Credits	3	**External Marks:**	70
Prerequisites: None			
Course Objectives			

1) To understand the concepts about stresses and strains.
2) To gain knowledge about the components of transmission systems.
3) To acquire knowledge about project management techniques.
4) To gain knowledge about manufacturing processes and materials.
5) To understand the concepts of boilers, steam power plant, petrol and diesel engines.

Course Outcomes

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

CO1	Discuss the concepts about stresses and strains.
CO2	Justify about the components of transmission systems.
CO3	Analyze Problems related to project management techniques.
CO4	Utilize knowledge about manufacturing processes and materials.
CO5	Explain the concepts of boilers, steam power plant, petrol and diesel engines.

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

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

UNIT I

STRESSES AND STRAINS: Types of stresses and strains, elasticity, plasticity, Hooke's law, stress-strain diagrams, modules of elasticity, Poisson's ratio, linear and volumetric strain, compound bars and temperature stresses.
Types of supports – loads – Shear force and bending moment for cantilever and simply supported beams.

UNIT II

TRANSMISSION SYSTEMS: Belts –Ropes and chain: belt and rope drives, velocity ratio, slip, length of belt , open belt and cross belt drives, ratio of friction tensions, power transmitted by belts. Gears- Nomenclature, classification, Gear Trains- velocity ratio, classification.

UNIT III

PROJECT MANAGEMENT: CPM, PERT, JIT, MRP, ERP, Work Study, Time study and sampling.

UNIT IV

MANUFACTURING PROCESSES: Introduction to metal casting, forming, welding and machining processes. Working of lathe, shaper, milling machines, CNC machines. Introduction to materials- metals- ferrous, non-ferrous and non-metals.

UNIT V

STEAM BOILERS: Introduction to boilers, working Babcock and Willcox and Cochran boilers.
STEAM POWER PLANT: Plant layout, working of different circuits.
Internal combustion Engines: classification of IC engines, basic engine components and nomenclature, working principle of engines, Four strokes and two stroke petrol and diesel engines,

comparison of CI and SI engines, comparison of four stroke and two stroke engines.
Text Book: 1) Strength of Materials and Mechanics of Structures, B.C.Punmia, Standard Publications and distributions, 9 th Edition, 1991. 2) Thermal Engineering, Ballaney,P.L., Khanna Publishers, 2003. 3) Elements of Mechanical Engineering, A.R.Asrani, S.M.Bhatt and P.K.Shah, B.S. Pub.
REFERENCE BOOKS:
1) Elements of Mechanical Engineering, M.L.Mathur, F.S.Metha& R.P.Tiwari Jain Brothers Publ., 2009. 2) Theory of Machines, S.S. Rattan, Tata McGraw Hill., 2004 & 2009.

III B.TECH II SEMESTER

Course Code:
ADVANCED MATERIALS
(OPEN ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To gain knowledge about the metals and alloys and their utility in different environments.
2) To acquire knowledge about polymers and ceramics and their applications.
3) To analyze composite materials along with reinforcements and their applications.
4) To understand the basics of shape memory alloys and functionally graded materials.
5) To gain knowledge about the nanomaterials and their applications.

Course Outcomes

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

CO1	Explain the metals and alloys and their utility in different environments.
CO2	Illustrate about polymers and ceramics and their applications.
CO3	Analyze composite materials along with reinforcements and their applications.
CO4	Apply the basics of shape memory alloys and functionally graded materials.
CO5	Analyze the knowledge about the nanomaterials and their 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	√	√	√	√		√	√					√
CO2	√	√	√	√		√	√					√
CO3	√	√	√	√		√	√					√
CO4	√	√	√	√		√	√					√

CO5	√	√	√	√		√	√					√

UNIT I

METALS & ALLOYS: Metallic materials- super alloys, Aluminium, Magnesium, titanium and Nickel based alloys and inter-metallics, Materials for cryogenic application, Materials for space environment, Evaluation of materials for extreme environment, Introduction to metallic foams.

UNIT II

POLYMERS: Natural Polymers-Synthetic polymers-Chemical & Physical structure, properties-glass-transitiontemperature-Thermosets-Thermoplastics- characteristics & applications of polymers-Elastomers- Processing of plastics.

CERAMICS: Applications - characteristics- classification-Processing of ceramics- Powder preparations- consolidation- hot compaction-drying- sintering-finishing of ceramics-Areas of application.

UNIT III

COMPOSITE MATERIALS: Introduction, classification: polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon–carbon composites, fiber- reinforced composites and nature-made composites, and applications

REINFORCEMENTS: Fibers- glass, silica, Kevlar, carbon, boron, silicon carbide, and borncarbide fibers.

UNIT IV

SHAPE MEMORY ALLOYS: Introduction-shape memory effect-classification of shape memory alloys-composition-properties and applications of shape memory alloys.

FUNCTIONALLY GRADED MATERIALS: Types of functionally graded materials-classification different systems-preparation-properties and applications of functionally graded materials.

UNIT V

NANO MATERIALS: Introduction-properties at nano scales-advantages & disadvantages applications in comparison with bulk materials (nano – structure, wires, tubes, composites). state of art nano advanced- topic delivered by student.

Text Book:

1) Nano material /A.K. Bandyopadyay/New age Publishers.
2) Material science and Technology: A comprehensive treatment/Robert W.Cahn, /VCH.
3) Engineering Mechanics of Composite Materials / Isaac and M Daniel/Oxford University Press.

REFERENCE BOOKS:

1) Mechanics of Composite Materials / R. M. Jones/ Mc Graw Hill Company, New York, 1975.
2) Analysis of Laminated Composite Structures / L. R. Calcote/Van Nostrand Rainfold,NY 1969.
3) Analysis and performance of fibre Composites /B. D. Agarwal and L. J. Broutman /Wiley-
4) Interscience, New York, 1980.
5) Mechanics of Composite Materials - Second Edition (Mechanical Engineering) /Autar K.Kaw /CRC Press.

III B.TECH II SEMESTER

Course Code:

INTRODUCTION TO AUTOMOBILE ENGINEERING
(OPEN ELECTIVE-II)

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

Prerequisites: None

Course Objectives

1) To understand various components of four wheeler automobile.
2) To gain knowledge of different parts of transmission system.
3) To understand the concepts of steering and suspension systems.
4) To gain knowledge about the braking system and electrical system used in automobiles.
5) To understand the concepts about engine specifications and service, safety of automobiles.

Course Outcomes

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

CO1	Explain various components of a four wheeler automobile.
CO2	Discuss the different parts of transmission system.
CO3	Justify the concepts of steering and suspension systems.
CO4	Utilize the knowledge about the braking system and electrical system used in automobiles.
CO5	Analyze the concepts about engine specifications and service, safety of automobiles.

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

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

UNIT I

INTRODUCTION: Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems.

UNIT II

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter, propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres and their making.

UNIT III

STEERING SYSTEM: Steering geometry – camber, castor, king pin rake, combined angle toein, centre point steering. types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

UNIT IV

BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder requirement of brake fluid, pneumatic and vacuum brakes. **ELECTRICAL SYSTEM:** Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.
UNIT V
ENGINE SPECIFICATION AND SAFETY SYSTEMS: Introduction- engine specifications with regard to power, speed, torque, no. of cylinders and arrangement, lubrication and cooling etc. **SAFETY:** Introduction, safety systems - seat belt, air bags, bumper, anti-lock brake system (ABS), wind shield, suspension sensors, traction control, mirrors, central locking and electric windows, speed control.
Text Book: 1) Automotive Mechanics – Vol. 1 & Vol. 2 / Kirpal Singh/standard publishers 2) Automobile Engineering / William Crouse/TMH Distributors 3) Automobile Engineering/P.S Gill/S.K. Kataria& Sons/New Delhi.
REFERENCE BOOKS:
1) Automotive Engines Theory and Servicing/James D. Halderman and Chase D. Mitchell Jr.,/ Pearson education inc. 2) Automotive Engineering / K Newton, W.Steeds& TK Garrett/SAE 3) Automotive Mechanics: Principles and Practices/ Joseph Heitner/Van Nostrand Reinhold 4. Automobile Engineering / C Srinivasan/McGraw-Hill.

III B.TECH II SEMESTER

Course Code:
HEAT TRANSFER LAB

Labs / Instructions Hours/Week	3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35
Prerequisites: Knowledge on vernier callipers, Screw guage, common balance			
Course Objectives:			
1) To determine the heat transfer rate and coefficient. 2) To determine the thermal conductivity, efficiency and effectiveness. 3) To determine the emissivity and Stefan-Boltzman constant. 4) To determine critical heat flux and investigate Lambert's cosine law. 5) To experiment with Virtual labs and analyze conduction, HT coefficient. 6) To experiment with Virtual labs and investigate Lambert's laws.			
Course Outcomes:			
CO1	Determine the heat transfer rate and coefficient.		
CO2	Demonstrate the thermal conductivity, efficiency and effectiveness.		
CO3	Determine the emissivity and Stefan-Boltzman constant.		
CO4	Identify critical heat flux and investigate Lambert's cosine law.		
CO5	Experiment with Virtual labs and analyse conduction, HT coefficient.		
CO6	Build the knowledge with Virtual labs and investigate Lambert's laws.		
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)			

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

List of Experiments

1. Determination of overall heat transfer co-efficient of a composite slab
2. Determination of heat transfer rate through a lagged pipe.
3. Determination of heat transfer rate through a concentric sphere
4. Determination of thermal conductivity of a metal rod.
5. Determination of efficiency of a pin-fin
6. Determination of heat transfer coefficient in natural and forced convection
7. Determination of effectiveness of parallel and counter flow heat exchangers.
8. Determination of emissivity of a given surface.
9. Determination of Stefan-Boltzmann constant.
10. Determination of heat transfer rate in drop and film wise condensation.
11. Determination of critical heat flux.
12. Determination of Thermal conductivity of liquids and gases.
13. Investigation of Lambert's cosine law.

PART-B

Virtual labs (https://mfts-iitg.vlabs.ac.in/) on

1) Conduction Analysis of a Single Material Slab
2) Conduction Analysis of a Single Material Sphere
3) Conduction Analysis of a Single Material Cylinder
4) Conduction Analysis of a Double Material Slab
5) Conduction Analysis of a Double Material Sphere
6) Conduction Analysis of Double Material Cylinder
7) To determine the overall heat transfer coefficient (U) in the (i) parallel flow heat exchanger and (ii) Counter flow heat exchanger
8) To investigate the Lambert's distance law.
9) To investigate the Lambert's direction law (cosine law).

Note: Virtual labs are only for learning purpose, and are not for external examination.

TEXT BOOKS:

REFERENCE BOOKS:

III B.TECH II SEMESTER

Course Code:
CAE & CAM LAB

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

Prerequisites: Knowledge on vernier callipers, Screw guage, common balance

Course Objectives:

1) To experiment with trusses and beams to determine stress, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis.
2) To demonstrate part programmes using FANUC controller.
3) To generate G-code for automated tool path using CAM software.
4) To demonstrate with rapid prototyping machine and to print simple parts.
5) To experiment with virtual 3D printing simulation using Vlabs.

Course Outcomes:

CO1	Experiment with trusses and beams to determine stress, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis.
CO2	Create part programmes using FANUC controller.
CO3	Apply G-codes for automated tool path using CAM software.
CO4	Analyze about rapid prototyping machine and to print simple parts.
CO5	Experiment with virtual 3D printing simulation using Vlabs.

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

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

List of Experiments

1. Experiments to determine stresses, deflection, natural frequencies, harmonic analysis, HT analysis and buckling analysis (Any three experiments to be done).
a) Determination of deflection and stresses in 2D and 3D trusses and beams.
b) Determination of principal and Von-mises stresses in plane stress, plane strain and axisymmetric components.
c) Determination of stresses in 3D and shell structures (at least one example in each case)
d) Estimation of natural frequencies and mode shapes, harmonic response of 2D beam.
e) Steady state heat transfer analysis of plane and axisymmetric components.
f) Buckling analysis

2. Study of CNC part programming fundamentals and write part programmes for simple components on CNC lathe and Mill and Study of RP machine. (Any three experiments to be done). A. CNC part programming for turned components using FANUC Controller (i) Plain turning and facing (ii) Step Turning Operation (iii) Taper turning B. CNC programming for milled components using FANUC Controller (i) circular interpolation (ii) End milling (iii) Pocket milling 3. Automated CNC Tool path and G-Code generation using CAM packages. 4. Study and demonstration of RP machine-creation of simple parts. 5. Virtual 3D Printing Simulation lab using Vlabs. https://3dp-dei.vlabs.ac.in/List%20of%20experiments.html
TEXT BOOKS:
REFERENCE BOOKS:

III B.TECH II SEMESTER

Course Code:
MEASUREMENTS & METROLOGY LAB

Labs / Instructions Hours/Week	3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35
Prerequisites: Knowledge on vernier callipers, Screw guage, common balance			
Course Objectives:			
1) To demonstrate the calibration experiments with different gauges, transducers, thermocouple and temperature detector. 2) To demonstrate the calibration experiments with rotameter, seismic apparatus. 3) To demonstrate the calibration experiments with vernier calipers, micrometer, height and dial gauges. 4) To analyze various machine tools for their alignment. 5) To measure angular and taper measurements, straightness, surface roughness.			
Course Outcomes:			
CO1	Demonstrate the calibration experiments with different gauges, transducers, thermocouple and temperature detector.		
CO2	Illustrate the calibration experiments with rotameter, seismic apparatus.		
CO3	Demonstrate the calibration experiments with vernier calipers, micrometer, height and dial gauges.		
CO4	Analyze various machine tools for their alignment.		
CO5	Measure angular and taper measurements, straightness, surface roughness.		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2-Medium, 3 – High)												
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	√	√	√									
CO2	√	√	√									
CO3	√	√	√									
CO4	√	√	√									
CO5	√	√	√									
CO6	√	√	√									

List of Experiments

Note: At least 8 experiments from each lab are to be conducted

MEASUREMENTS LABORATORY

1. Calibration of pressure gauge.
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge.
5. Calibration of thermocouple.
6. Calibration of capacitive transducer.
7. Study and calibration of photo and magnetic speed pickups.
8. Calibration of resistance temperature detector.
9. Study and calibration of a rotameter.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.

METROLOGY LABORATORY

1. Calibration of vernier calipers, micrometer, vernier height gauge and dial gauges.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear tooth vernier caliper for tooth thickness inspection and flange micrometer for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test on drilling machine.
6. Machine tool alignment test on milling machine.
7. Angle and taper measurements with bevel protractor, Sine bar, rollers and balls.
8. Use of spirit level in finding the straightness of a bed and flatness of a surface.
9. Thread inspection with two wire/ three wire method & tool makers microscope.
10. Surface roughness measurement with roughness measuring instrument.

TEXT BOOKS:

1.Department manual

REFERENCE BOOKS:

NRI INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME
III YEAR I SEMESTER

NR1A20
2022-23

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	PC 20A3104401	Linear and Digital Integrated Circuits	3	-	-	3	30	70	100	3
2	PC 20A3104402	Antennas and Wave Propagation	3	-	-	3	30	70	100	3
3	PC 20A3104403	Digital Communications	3	-	-	3	30	70	100	3
4	OE	Open Elective	3	-	-	3	30	70	100	3
5	PE 20A3104511	i) Computer architecture and Organization	3	-	-	3	30	70	100	3
	PE 20A3104512	ii) Biomedical Engineering								
	PE 20A3104513	iii) Electromagnetic Interference and Electromagnetic Compatibility								
6	PC LAB 20A3104491	Linear and Digital Integrated Circuits Lab	-	-	3	3	15	35	50	1.5
7	PC LAB 20A3104492	Digital Communications Lab	-	-	3	3	15	35	50	1.5
8	SC* 20A3104991	Internet of Things	1	-	2	3	-	50	50	2
9	MC 20A3100803	Intellectual Property Rights and Patents	-	-	2	3	30	70	100	0
	Summer Internship two months (mandatory)after second year (to be evaluated during V semester) 20A3104791		0	0	0	0	15	35	50	1.5
	Total		16	-	10	27	255	595	850	21.5

Head, ECE Department
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - I Semester
Skill Course (SC)

L	T	P	C
1	0	2	2

INTERNET OF THINGS

Lecture – Practical:	1-2 Hours	**Internal Marks:**	15
Credits:	2	**External Marks:**	35

Prerequisites: Embedded Systems, Microcontrollers, Operating Systems, Programming.

Course Objectives:

- To Understand Smart Objects and IoT architecture.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To acquaint with the various security concepts in IoT architecture.
- To build simple IOT system using Arduino and Raspberry PI platform.
- To understand data analytics and cloud in the context of IOT.

Course Outcomes:

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

CO1	Summarize on the term 'internet of things' in different contexts and to learn about Internet of Things with the help of Arduino and Raspberry Pi.
CO2	Comprehend and analyze Software defined networks.
CO3	Understand the communication between microcontroller and pc using serial communication.
CO4	Analyze various protocols for IoT.
CO5	Acquire knowledge to interface sensors and actuator with microcontroller based Arduino platform.
CO6	Apply data analytics and use cloud offerings related to design and develop a solution for a given application using APIs and test for errors in the application.

Course Content(Syllabus)

UNIT I

Introduction to IoT: Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Role of Cloud in IoT, Security aspects in IoT, Elements of IoT Hardware Components- Computing- Arduino, Raspberry Pi.

UNIT II

IOT and M2M: Software defined networks, Network Function Virtualization, Difference between SDN and NFV for IOT, Basics of IOT system management with NETCONF, YANG-NETCONF, YANG, NETOPEER.

UNIT III

IoT Application Development: Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT IV

BUILDING IOT APPLICATIONS: Introduction to Arduino IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor. Embedded 'C' Language basics. Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135 interfacing HC-05(Bluetooth module) Control/handle 220v AC supply – interfacing relay module.

UNIT V

Cloud Analytics for IoT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

TEXT BOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw HillEducation, 2017.
2. The Definitive Guide to the ARM Cortex-M0 byJosephYiu,2011
3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press, 2015.

REFERENCES:

Cypress Semiconductor/PSoC4BLE (Bluetooth Low Energy)Product Training Modules.

1. Pethuru Raj and AnupamaC.Raman,"The Internet of Things:EnablingTechnologies,Platforms, and Use Cases", CRC Press,2017.
2. Macro Schwartz, "Internet of Things with Arduino", Open Home Automation

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NRIA 20
2022-23.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME
III 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	PC 20A3204401	Microprocessors and Microcontrollers	3	-	-	3	30	70	100	3
2	PC 20A3204402	Digital Signal Processing	3	-	-	3	30	70	100	3
3	PC 20A3204403	VLSI Design	3	-	-	3	30	70	100	3
4	PE 20A3204511 PE 20A3204512 PE 20A3204512	i) Optical Communications ii) Embedded Systems iii) Radar Systems	3	-	-	3	30	70	100	3
5	OE	Open Elective	3	-	-	3	30	70	100	3
6	PC LAB 20A3204491	VLSI Lab	-	-	3	3	15	35	50	1.5
7	PC LAB 20A3204492	Microprocessors and Microcontrollers Lab	-	-	3	3	15	35	50	1.5
8	PC LAB 20A3204493	Digital Signal Processing Lab	-	-	3	3	30	70	100	1.5
9	SC* 20A3204991	Sensors and Instrumentation	2	-	-	2	-	50	50	2
10	MC 20A3200803	Professional Ethics and Human Values	2	-	-	2	30	70	100	0
Total			19	-	9	28	240	630	900	21.5
Honors/Minor Courses(the hours distribution can be 3-0-2 or 3-1-0)			4	-	-	4	30	70	100	4
Industrial / Research Internship(Mandatory) 2 Months during summer vacation										

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NR1A20

III Year - II Semester | **L T P C**
Skill Course (SC) | **1 0 2 2**

SENSORS AND INSTRUMENTATION

(Skill Course)

Lecture-Practical:	1-2	**Internal Marks:**	15
Credits:	2	**External Marks:**	35

Prerequisites: Basic electrical and electronics engineering, basics of measuring systems and method of measurement.

Course Objectives:

- To make students familiar with the constructions and working principle of different types of sensors and transducers.
- To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.
- To make students aware of the latest trends in sensor technology.
- To make the students identify the necessary sensor for various applications.

Course Outcomes:

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

CO1	Understanding the concept of measurement system
CO2	Identifying concepts in common methods for converting a physical parameter into an electrical quantity.
CO3	Applying concepts in advances in transducers for various engineering applications.
CO4	Choose proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc.
CO5	Applying knowledge on advanced sensor which related to detect the enhanced parameters using sensors.
CO6	Set up testing strategies to evaluate performance characteristics of different types of sensors and transducers and develop professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

Course Content (Syllabus)

UNIT I

INTRODUCTION TO INSTRUMENTATION: Functional elements of the Measurement system, Static and dynamic characteristics, Errors in measurements - systematic, gross, random; Loading effect, Calibration.

UNIT II

Transducers-1: Introduction to transducers, Classification, Characteristics, working principles of strain gauge, Displacement measurement using Potentiometer and LVDT, Temperature measurement using thermocouple, RTD and thermistor.

UNIT III

Transducers-2: Piezoelectric transducer for force and pressure measurement, Speed measurement, Capacitive transducer and Inductive transducers.

UNIT IV

SENSORS-1:
Introduction to sensors, Light sensors using LDR and photo diode, Level and distance measurement using Ultrasonic sensor, Accelerometer.

UNIT V

SENSORS-2: Proximity sensor, Humidity sensor, Analog, soil moisture sensor, Digital data acquisition, Single channel, multi-channel data acquisition, PC based data acquisition.

Experiments:

1. **Strain gauge.**
2. **Linear Displacement using LVDT**
3. **Temperature calibration using thermocouple.**
4. **Pressure measurement.**
5. **Speed measurement.**
6. **Capacitance trainer module.**
7. **Light sensor.**
8. **Distance measurement using ultrasonic sensor.**
9. **Accelerometer.**
10. **Proximity sensor.**
11. **Humidity measurement.**
12. **Soil moisture sensor.**

TEXT BOOKS:

1. Doebelin, E.O., "Measurement systems – Application and Design", McGraw Hill.
2. D. Patranabis, "Sensors and Transducers", PHI, 2nd Edition.

REFERENCES:

1. Instrumentation Measurement & Analysis, by B.C. Nakra, K.K. Choudry, (TMH).
2. Transducers and Instrumentation, by D.V.S. Murthy (PHI).

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	-	-	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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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

B.TECH PROGRAMME

PRPOPSED STRUCTURE FOR THIRD YEAR

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/D	Total	CIA	SEA	Total	
1	20A3105402	Artificial Intelligence	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3105403	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A310560X	OE-1	3	0	0	3	30	70	100	3
5	20A310551X	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3105492	AI Programming Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	Employability Skills-1	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			17	0	10	27	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective - 1
20A3105511	1.1 Cloud computing
20A3105512	1.2 Software Testing Methodologies and Tools
20A3105513	1.3 Data Warehousing and Data Mining
20A3105514	1.4 Advanced Data Structures

H.O.D

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

PRPOPSED 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/D	Total	CIA	SEA	Total	
1	20A3105402	Artificial Intelligence	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3105403	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A310560X	OE-1	3	0	0	3	30	70	100	3
5	20A310551X	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3105492	AI Programming Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	Employability Skills-1	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			17	0	10	27	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective - 1
20A3105511	1.1 Cloud computing
20A3105512	1.2 Software Testing Methodologies and Tools
20A3105513	1.3 Data Warehousing and Data Mining
20A3105514	1.4 Advanced Data Structures

Course Title: Artificial Intelligence

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

Prerequisites: None

Course Objectives

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:

Upon 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

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	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	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, HeuristicSearchTechniques,Iterative-DeepeningA*,ConstraintSatisfaction

UNIT II:

LogicConceptsandLogicProgramming:Introduction,PropositionalCalculus,Propositional Logic,NaturalDeduction System, Resolution Refutation in Propositional Logic, Predicate Logic,Logic Programming. RepresentingKnowledgeUsingRules:Logicprogramming,ProceduralVsDeclarativeknowledge,Forward Vs Backward Reasoning, Matching,Control Knowledge

UNIT III:

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge RepresentationusingSemanticNetwork,ExtendedSemanticNetworksforKR, Knowledge Representation usingFrames,Conceptualdependencies,Scripts

UNIT IV:

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and AugmentedTransitionNets,SemanticAnalysis,NLPUnderstandingSystems;

Fuzzy Logic: CrispSets,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-spacesearch–partial-orderplanning–planninggraphs–planningandactingintherealworld

UNIT V:

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of ExpertSystems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools,ExpertSystemShells.AIProgramminglanguages:Overviewof LISPandPROLOG, ProductionSysteminProlog

Text Book:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

REFERENCE BOOKS:

1. ArtificialIntelligence,GeorgeFLuger,PearsonEducationPublications
2. ArtificialIntelligence:AmodernApproach,RussellandNorvig,PrenticeHall
3. ArtificialIntelligence,RobertSchalkoff,Mcgraw-HillPublications
4. ArtificialIntelligenceandMachineLearning,VinodChandraS.S.,AnandHareendranS.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://nptel.ac.in/courses/106105077
3. https://nptel.ac.in/courses/106102220
4. https://onlinecourses.nptel.ac.in/noc19_me71/preview
5. https://nptel.ac.in/courses/106106126

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Course Title: Computer Networks

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

Prerequisites: Computer Networks

Course Objectives:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach---Analysis

Course Outcomes:

CO1	Able to understand OSI and TCP/IP models.
CO2	Understand data link layer protocols and flow control
CO3	Understand routing and network layer protocols and IPV4
CO4	Understand transport layer congestion, flow control and protocols
CO5	Understand application layer protocols

UNIT I : INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

PHYSICAL LAYER Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications

UNIT II: DATA LINK LAYER:

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, Bridges.

UNIT III: NETWORK LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. OSPF. IPV4

UNIT IV TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols congestion control.

UNIT V APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

Text Book:

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. **www.tutorialspoint.com**
2. nptl.ac.in/courses/

Course Title: Design and Analysis of Algorithms

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

Prerequisites: None

Course Objectives

- 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 Completion of the course, the students 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	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2
CO6	3	-	3	3	-	-	-	-	-	-	-	-	3	3	3

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.

UNIT II Divide and Conquer: Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Finding the Maximum and Minimum
Unit III **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 IV 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 V 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
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

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Course Code-Cloud Computing

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

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

Course Objectives:

The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Course Outcomes:

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

CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
CO5	Describe the features of Resource Management systems

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

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

UNIT-1: 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

UNIT-2: 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-3: 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.

UNIT-4 :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-5: Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

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. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

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**
2. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

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Course Title: Software Testing Methodologies and Tools

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

Prerequisites: Software Engineering

Course Objectives

Fundamentals for various testing methodologies.

- 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	Understand the basic testing procedures.
CO2	Able to support in generating test cases and test suites.
CO3	Able to test the applications manually by applying different testing methods and automation tools..
CO4	Apply tools to resolve the problems in Real time environment.

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

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-							-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-							2	2	-
CO4	3	3	2	-	-	-							-	2	3

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.

UNIT II:

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques, Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability

UNIT III:. Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips

UNIT IV:. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

UNIT V: Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

Text Book

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

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

Course Title: Data Warehousing and Data Mining

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

Prerequisites: Data Structures

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	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	-	-	-	-	2	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	-	3	2	-	-	-	-	-	-	2	2	2	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	-	2	3

UNIT I: DATAWAREHOUSING AND BUSINESSANALYSIS

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 OVERVIEW AND ADVANCEDPATTERN MINING

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 AND PREDICTION

Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines

UNIT IV: CLUSTERING ANALYSIS

Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN& OPTICS, introduction to outlier analysis

UNIT V: WEB AND TEXT MINING

Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining, unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

Text Books

[1].Jiawei Han and Micheline Kamber, -Data Mining Concepts and Techniquesl, Third Edition, Elsevier, 2012.

REFERENCE BOOKS:

[1].G.K.Gupta,—IntroductiontoDataMiningwithCaseStudiesl,EasterEconomyEdition,Prentice Hall of India, 2006
[2].APang-Ning Tan, Michael Steinbach and Vipin Kumar, -Introduction to DataMiningl, Second Edition Pearson Education, 2016
[3].K.P. Soman, ShyamDiwakar and V. Ajay -Insight into Data mining Theory and Practicel, Easter Economy Edition, Prentice Hall of India, 2006

E-RESOURCES

Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017)https://www.youtube.com/watch?v=J326LIUrZM8&t=4s

How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network(2016)https://www.youtube.com/watch?v=fwnaijgpih,

Course Title: Advanced Data Structures

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

Prerequisites: Data Structures

Course Objectives

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balancedsearch 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 differentsolutions.

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3

Dictionaries: Sets,Dictionaries,Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques

UNIT II: Dynamic Hashing and Skip Lists

Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Hash Table Restructuring, Skip Lists,Analysis of Skip Lists.

UNIT III: 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 IV: Priority Queues

Binary Heaps : Implementation of Insert and Delete min, Creating Heap.
Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy BinomialQueues

UNIT V: 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 Book 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 Title: Computer Networks Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1,5	**External Marks:**	35

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 (like netstat, 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 Title: Artificial Intelligence Lab

Lecture–Tutorial-Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Artificial Intelligence concepts

Course Objectives

- To provide skills for designing and analyzing AI based algorithms.
- To enable students to work on various AI tools.
- To provide skills to work towards solution of real life problems.

CourseOutcomes:
UponCompletionofthecourse,thestudentswillbeableto

CO1: Elicit, analyze and specify software requirements.
CO2: Simulate given problem scenario and analyze its performance.
CO3: Develop programming solutions for given problem scenario.

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	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-

List of Experiments

Use any language such as C/C++/LISP/PROLOG

1. Solve "Water Jug Problem".
2. Write a program to solve 8 queens' problem
3. Solve any problem using depth first search.
4. Solve any problem using best first search.
5. Solve 8-puzzle problem using best first search
6. Write A Program to Generate the output for A* Algorithm
7. Write a program to implement tower of Hanoi
8. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
9. Write a program to solve the Monkey Banana problem
10. Write a program to solve Hill climbing.
11. Implementation of searching techniques in AI.
12. Installation and working on various AI tools viz. Python, R tool, GATE, NLTK, MATLAB, etc.
13. Data preprocessing and annotation and creation of datasets.
14. Learn existing datasets and Treebanks
15. Implementation of Knowledge representation schemes.
16. Application of Classification and clustering problem.
17. Natural language processing tool development.

Note: The concerned Course Coordinator will finalize the actual list of experiments/problems at the start of semester based on above generic list.

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URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nriit.edu.in

Course Title: DEVOPS LAB

Lecture – Practical:	0-0-4	**Internal Marks:**	15
Credits	2	**External Marks:**	35

Prerequisites:
Working knowledge of one or more high-level programming languages (C#, Java, PHP, Ruby, Python, etc.) Intermediate knowledge of administering Linux or Windows systems at the command-line level

Course Objectives : The Objective of this course is to give a strong foundation of the Development and its Operations.

Course Outcomes

Upon successful completion of the course, the student will be able to: Understand the traditional software development. Learn the rise of agile methodologies.• Define and design purpose of DevOps.•

CO1	Realize the importance of agile software development practices in determining the requirements for a software system
CO2	Analyze and execute iterative software development processes to manage software development activities.
CO3	Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need.
CO4	Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality.
CO5	Perform software process improvement by applying DevOps capabilities at enterprise level.

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	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	2	-	-		3	2	3	3
CO2	2	3	2	3	-	-	-	-	-	-	2	3	3	3	3
CO3	2	2	3	3	2	-	2	-	2	-	2	-	2	-	3
CO4	2	-	2	2	2	-	2	-	-	-	-	3	2	3	-
CO5	-	-	2	2	2	-	3	-	2	-	2	3	3	3	3

PROGRAMS LIST

1) **In-depth knowledge of DevOps methodology**
2) **Implementing Software Version Control**
3) **Containerizing Code on production using Docke**
4) **Creating CI/CD Pipelines using Jenkins**
5) **Configuration Management using Puppet and Ansible**
6) **Automating build and test using Selenium and Maven**
7) **Container Orchestration using Kubernetes**
8) **Performance Tuning and Monitoring using Nagios**
9) **Devops Tools : Jenkins,Docker. Phantom.,NagiosVagrant,Ansible,GitHub.**

E-RESOURCES
https://www.guru99.com/

Course Code-Employability Skills-I

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

Prerequisites: None

Course Objectives:

1.To explore and practice basic communication skills

2.To learn skills for effective discussions & team work

3.To assess and improve personal grooming

Course Outcomes

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

CO1	Establish effective communication with employers, supervisors, and co-workers
CO2	Identify to explore their values and career choices through individual skill assessments
CO3	Adapts positive attitude and appropriate body language
CO4	Interpret the core competencies to succeed in professional and personal life

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	PO12	PSO1	PSO2	PSO3
CO1								2		2					
CO2								2							
CO3										2					2
CO4								2		2		2			

UNIT I: Soft Skills:

An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.

Unit 2: Positivity and Motivation:

Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels

UNIT III: Interpersonal Communication:

Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles, assertion, persuasion, negotiation.

UNIT IV: Public Speaking:

Skills, Methods, Strategies and Essential tips for effective public speaking.Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.

UNIT V: Non-Verbal Communication Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.
REFERENCE BOOKS: 1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011. 2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010. 3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011. 5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. 6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
B.TECH PROGRAMME

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/D	Total	CIA	SEA	Total	
1	20A3205403	Machine Learning	3	0	0	3	30	70	100	3
2	20A3205402	Compiler Design	3	0	0	3	30	70	100	3
3	20A3205401	Cryptography and Network Security	3	0	0	3	30	70	100	3
4	20A320560X	OE-2	3	0	0	3	30	70	100	3
5	20A320551X	PE-2	3	0	0	3	30	70	100	3
6	20A3205491	Machine Learning Lab	0	0	3	3	15	35	50	1.5
7	20A3205492	R Programming lab	0	0	3	3	15	35	50	1.5
8	20A3205493	Compiler Design Lab	0	0	3	3	15	35	50	1.5
9	20A3205991	MEAN Stack Technologies	0	0	4	4	15	35	50	2
10	20A3205801	Employability Skills - 2	2	0	0	2	30	70*	100	0
Total			17	0	13	30	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
20A3205511	2.1 Advanced Database Management Systems
20A3205512	2.2 Network Programming
20A3205513	2.3 Big data Analytics
20A3205514	2.4 Object Oriented Analysis and Design

H.O.D
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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/D	Total	CIA	SEA	Total	
1	20A3205403	Machine Learning	3	0	0	3	30	70	100	3
2	20A3205402	Compiler Design	3	0	0	3	30	70	100	3
3	20A3205401	Cryptography and Network Security	3	0	0	3	30	70	100	3
4	20A320560X	OE-2	3	0	0	3	30	70	100	3
5	20A320551X	PE-2	3	0	0	3	30	70	100	3
6	20A3205491	Machine Learning Lab	0	0	3	3	15	35	50	1.5
7	20A3205492	R Programming lab	0	0	3	3	15	35	50	1.5
8	20A3205493	Compiler Design Lab	0	0	3	3	15	35	50	1.5
9	20A3205991	MEAN Stack Technologies	0	0	4	4	15	35	50	2
10	20A3205801	Employability Skills - 2	2	0	0	2	30	70*	100	0
Total			17	0	13	30	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
20A3205511	2.1 Advanced Database Management Systems
20A3205512	2.2 Network Programming
20A3205513	2.3 Big data Analytics
20A3205514	2.4 Object Oriented Analysis and Design

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/D	Total	CIA	SEA	Total	
1	Professional Core courses	Machine Learning	3	0	0	3	30	70	100	3
2	Professional Core courses	Compiler Design	3	0	0	3	30	70	100	3
3	Professional Core courses	Cryptography and Network Security	3	0	0	3	30	70	100	3
4	Open Elective Course/Job oriented elective	OE-2	2	0	2	4	30	70	100	3
5	Professional Elective courses	PE-2	3	0	0	3	30	70	100	3
6	Professional Core courses Lab	Machine Learning Lab	0	0	3	3	15	35	50	1.5
7	Professional Core courses Lab	R Programming lab	0	0	3	3	15	35	50	1.5
8	Professional Core courses Lab	Compiler Design Lab	0	0	3	3	15	35	50	1.5
9	Skill advanced course/ soft skill course*	MEAN Stack Technologies	0	0	4	4	15	35	50	2
10	Mandatory course (AICTE suggested)	Employability Skills - 2	2	0	0	2	30	70	100	0
Total			16	0	15	31	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
	2.1 Advanced Database Management Systems
	2.2 Network Programming
	2.3 Big data Analytics
	2.4 Object Oriented Analysis and Design

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Course Title: Machine Learning

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

Prerequisites: Calculus and Probability

Course Objectives

1. Explain about data preprocessing and its uses in prediction
2. Explain how linear models are learning from the data.
3. Explain the Improving efficiency of the models using nonlinearity and ensembles
4. Explain how neural networks help in increasing efficiency

Course Outcomes

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

CO1	Understanding the machine learning basics and how data is preprocessed
CO2	How linear models help in prediction
CO3	Distance based models complexity
CO4	Probabilistic models understanding
CO5	Nonlinear models and ensembles improve efficiency

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-

UNIT I The Ingredients of Machine Learning:

Introduction to Machine Learning, Types of Machine Learning, Models - The output of Machine Learning

Binary Classification and related tasks: Classification, Calculating accuracy in classification.

UNIT II(NLP):

Text data preprocessing, Bag of words, TF IDF, Word2vec, Plane and Hyper-plane for machine learning, Data Cleaning, Data Preprocessing (Min – Max Scaling), Normalizing, Standardize, Mean, Variance, Standard Deviation, One Hot Encoding

Unit III :

Beyond Binary Classification: Handling more than two classes, finding minimum and maximum of a function, Gradient Descent, Linear Regression, Multiple Regression, Calculating accuracy in regression (RMSE), Effect of outliers and noisy

data, overfitting and underfitting models, K-fold cross validation, confusion matrix for cross validation imbalanced data, ROC_AUC curve for imbalanced data, F1 score

UNIT IV :

Logistic Regression: Sigmoid function in logistic regression, loss functions in logistic regression.
Linear Models: The Least Square method, Support Vector Machine (SVM)
Tree Model: Decision Trees, Ranking and Probability estimation trees,

UNIT V :

Distance Based Models: Distance Measures (Euclidean, Manhattan and Minkowski), Neighbors, KNN, Distance based clustering, Hierarchical Clustering, Agglomerative Clustering
Probabilistic model: Naive Bayes algorithm for classification, Laplace, smoothing
Model Ensembles: Bagging and Random Forest, Boosting

Text Book

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

E-RESOURCES

1.https://alex.smola.org/drafts/thebook.pdf
2.https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045

Title of the Course: Compiler Design

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

Prerequisites: Formal Language and Automata Theory

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	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
CO2	To apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
CO3	To write the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO4	To employ the knowledge of modern compiler & its features.
CO5	To 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	3	3						-	2
CO2	2	3	3	2	2	2				2	2	3
CO3	3	3	3	3	3	2						2
CO4	3	2	3	2	3					2	2	2

CO5	3	3	3	1	-	2	1	1	-	2	-	2	

UNIT I :

Overview of Compilation: Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA. Interpretation, bootstrapping, LEX - lexical analyzer generator and Boot Strapping.

UNIT II:

SYNTAX ANALYSIS: Context free grammars, Top down parsing – Backtracking, LL (1), Recursive Descent Parsing, Predictive Parsing. Bottom up Parsing: Shift Reduce parsing, LR and LALR parsing, Operator Precedence parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator.

UNIT III:

Semantic analysis: Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Type checker.
Symbol Tables: Symbol table format, organization for block structures languages. Block structures and non block structure storage allocation: static, runtime stack and heap storage allocation.

UNIT IV:

RUN-TIME ENVIRONMENT AND CODE GENERATION :
Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of a simple Code Generator.

UNIT V:

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.

Principal Sources of Optimization – Peep-hole optimization – DAG- Optimization of Basic Blocks-Global Data Flow Analysis – Efficient Data Flow Algorithm.

TEXT BOOKS:

1. Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, "Compilers Principles, Techniques & Tools", 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

Course Title: Cryptography and Network Security

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

Prerequisites: Students are expected to have knowledge on the following topics: Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies

Course Objectives

1. The Objectives of first unit is to present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking
2. The Objectives of second unit is to understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA
3. The objectives of third unit is to present the basic principles of public key cryptography, Distinct uses of public key cryptosystems
4. The objectives of fourth unit is to Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature
5. The objectives of fifth unit is to Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL & TLS. Present an overview of electronic mail security.
6. The objectives of fifth unit is to Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques

CourseOutcomes:

UponCompletionofthecourse,thestudentswillbeableto

CO1. Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks.

CO2. Distinguish the black ciphers and stream ciphers and apply them on a various symmetric cryptographic technique.

CO3. Understand the principle and mathematical models used in public-key cryptosystems by applying them on different (various) types of algorithms.

CO4. Analyze the message authentication functions with its types and digital certifications for secure communication.

CO5. Understand the user authentications principles and security approach at both the web and email.

CO6. Understand the concept of IP Security with its services and dealing with the prevention and detection of intrusions.

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	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	2	-	1	-	-	-	1	3	1	1
CO2	3	3	1	2	1	2	-	1	-	-	-	1	3	1	1
CO3	3	3	-	1	1	1	-	1	-	-	-	1	3	2	-

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

Unit–I

Introduction, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Mathematics of Cryptography

Classical Encryption Techniques, Symmetric Cipher Model,Substitution Techniques, Transposition Techniques

UNIT II:

Symmetric Encryption, Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard, BlowFish, IDEA, CAST-128 algorithms

UNIT III:

Asymmetric Encryption, Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Key Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, EllipticCipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode,

UNIT IV:

DATA INTEGRITY, Digital Signature schemes, & Key Management

Message Integrity and message authentication, Cryptographic hash functions, Digital Signature and Key Management

UNIT V:

Network Security: Security at Application layer: PGP and MIME, Security at Transport layer: SSL and TLS, Security at Network layer: IPSec, System Security

Text Book:

1. Cryptography and Network Security Principles and Practice 6th Edition, William Stallings, Pearson Education
2. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, 3E) Mc Gra Hill
3. AtulKahate, Cryptography and Network Security, TMH. (2003)

REFERENCE BOOKS:

1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition,2011, Pearson Education. 95
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

E-RESOURCES:

1. http://users.abo.fi/ipetre/crypto/

2. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
3. https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/
4. https://lecturenotes.in/subject/112/cryptography-and-network-security-cns
5. https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/
6. https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/
7. https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/

Course Title: Advanced Database Management Systems

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

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.

UNIT – II

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-III

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 – IV

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 – V

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:

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URL : www.nrigroupofcolleges.ac.in, Ph : 0866 2469666, Email : principal@nriit.edu.in

Course Title: Network Programming

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

Prerequisites: None

Course Objectives

- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes

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

CO1	Explain the client-server paradigm and socket structures.
CO2	Describe the basic concepts of TCP sockets and TCP echo client-server programs.
CO3	Discuss the UDP sockets and UDP echo client-server programs.
CO4	Explain Socket options and ability to understand IPC.
CO5	Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET 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	PO12	PSO1	PSO2	PS
CO1	3	2	3	3	-	-	-	-	-	-	-	-	3	3	-
CO2	-	2	3	3	-	-	-	-	-	-	-	-	2	2	
CO3	-	2	2	3	2	-	-	-	-	-	-	-	2	2	
CO4	2	2	3	-	-	-	-	-	-	-	-	-	3	-	
CO5	2	2	2	2	3	-	-	-	-	-	-	-	3	2	

UNIT I:

Introduction to Network Programming: OSI model-transport layer protocols: TCP, UDP and SCTP-network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments-Byte ordering functions-Byte manipulation functions-Address conversion functions

UNIT II:

TCP: introduction to TCP-TCP connection establishment and terminationTIME_WAIT State. Elementary TCP sockets – Socket-connect-bind-listen-accept-fork-exec function-concurrent servers-Close function-read and write functions

UNIT III:

TCP echo client server program-getsockname and getpeername functions I/O multiplexing: I/O models-Select function-TCP echo server using select function-shutdown function-Poll function

UNIT IV:

UDP: Introduction to UDP-difference between TCP and UDP-recvfrom( ) and sendto( ) functions-UDP echo client server program-UDP echo client server using select function. Socket Options: IPv4 socket options-IPv6 socket options
UNIT V: Generic socket options-TCP socket options. IPC: Introduction to IPC-forms of IPC-UNIX kernel support for pipes, FIFO, message queues, semaphores and shared memory Network programming concepts Implementation: FTP-ping-arp-SMTP-TELNET
Text Book: Unix Network programming, the socket networking API, W.Richard Stevens, bill fenner, Andrew m.rudoff ,PHI.
REFERENCE BOOKS: Advanced programming in the UNIX environment, W.Richard Stevens ,pearson education

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Course Title: Big Data Analytics

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

Prerequisites: None

Course Objectives

- To understand the need and application of Map Reduce.
- To understand the various search algorithms applicable to Big Data.
- To analyze and interpret streaming data.
- To learn how to handle large data sets in main memory.
- To learn the various clustering techniques applicable to Big Data.

Course Outcomes

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

CO1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing
CO2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO3	Students Interpret business models and scientific computing paradigms, and apply software tools for big data analytics
CO4	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media 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	PO12	PSO1	PSO2	PSO3
CO1	2			3			2					2	2		
CO2				3					3						2
CO3		3				3				2				3	
CO4				3					2			2	2		

UNIT I:

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Mode

UNIT II:

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.

UNIT III:

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV:

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V:

NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding — Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R

Text Book:

1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.

REFERENCE BOOKS:

1. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
2. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
3. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT Press,2001

E-RESOURCES

Big Data Analytics Tutorial (tutorialspoint.com)
Big Data Analytics Notes Pdf Download & List of Reference Books for BDA (ncertbooks.guru)

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Course Code-OBJECT ORIENTED ANALYSIS AND DESIGN

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

Prerequisites:

No particular skills are required as a prerequisite before learning UML.

Course Objectives:

- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language
- Specify, analyze and design the use case driven requirements for a particular system.
- Model the event driven state of object and transform them into implementation specific layouts.
- Identify, Analyze the subsystems, various components and collaborate them interchangeably.

Course Outcomes:

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

CO1	Analyse, design, document the requirements through use case driven approach
CO2	Identify, analyse, and model structural concepts of the system
CO3	Develop,explore the conceptual model into various scenarios and applications.
CO4	Apply the concepts of architectural design for deploying the code for software.
CO5	Identify, analyse, and model Architectural concepts of the system

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	PSO1	PSO2	PSO3
CO1	2	2	2		2							2			
CO2	3	3	3								2	2			
CO3	3	3			3	2					2	2			
CO4	2	2	3		2	2					2	3			
CO5	3	3	3		2	3					2	2			

UNIT I :

Introduction to UML:

The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, genericity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture

UNIT II:

Basic structural Modeling: Classes, relationships, common mechanisms, diagrams, Advanced structural modeling: advanced relationships, interfaces, types & roles, packages, instances.

Class & object diagrams: Terms, concepts, examples, modeling techniques, class & Object diagrams.

UNIT III:

Collaboration diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages.

Sequence diagrams: Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

UNIT IV:

Behavioral Modeling: Interactions, use cases, use case diagrams, activity diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, processes & threads, time and space, state chart diagrams.

UNIT V:

Architectural Modeling: Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

TEXT BOOKS:

1. The Unified Modeling Language User Guide, Grady Booch, Rambaugh, Ivar Jacobson, PEA

2. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Addison Wesley

REFERENCE BOOKS:

1. Head First Object Oriented Analysis &Design, Mclaughlin, SPD OReilly,2006

2. Object oriented Analysis& Design Using UML, Mahesh ,PHI

3. The Unified Modeling Language Reference Manual, 2/e, Rambaugh, GradyBooch,etc., PEA

4. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson

5 Object Oriented Analysis Design & implementation, Dathan.,Ramnath, University Press

6. Object Oriented Analysis & Design, John Deacon, PEA

7. Fundamentals of Object Oriented Analysis and Design in UML, M Pages-Jones, PEA

8. Object-Oriented Design with UML, Barclay, Savage, Elsevier,2008

E-RESOURCES:

1.https://www.geeksforgeeks.org/unified-modeling-language-uml-introduction/

2.https://www.javatpoint.com/uml

3.https://www.uml-diagrams.org/

Course Title: Machine Learning Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	75

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 machine learning models and using different accuracy techniques to improve the prediction percentage.

Course Outcomes:

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

CO1 Should be able to do data cleaning and data preprocessing

CO2 Should be able to apply imbalanced data sets accuracy

CO3 Should be able to apply machine learning techniques to large data sets

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. Implement data cleaning techniques
2. Implement data preprocessing techniques.
3. Make your data ready for model training.
4. Train, validate and test KNN model using gridsearchcv
5. Train, validate and test naïve bayes model
6. Train Validate and test logistic regression model.
7. Train Validate and test SVM model.
8. Train Validate and test random forest ensemble.

TEXT BOOKS:

1) **Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems (Colour Edition) Paperback – 23 October 2019 by AurelienGeron(Author)**
2) **Introduction to Machine Learning with Python: A Guide for Data Scientists (Greyscale Indian Edition) Paperback – 1 January 2016 by Andreas Muller**

E-RESOURCES:

www.numpy.org

www.pandas.org

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Course Code-R Programming Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

Course Objectives:

1. Learn the fundamentals of 'R'.
2. Use of Sorting and Searching techniques.
3. Learn the basic Statistical functions.
4. Use of Classifications.
5. Applications of Regressions.

Course Outcomes:

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

CO1	Perform basic 'R' operations.
CO2	Understand the Sorting and Searching techniques.
CO3	Perform Statistical functions on datasets.
CO4	Apply Classification and Regression techniques.
CO5	Perform Clustering.

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

List of Experiments

1. Implementation of Data Frames and Lists.
2. Implementation of Matrix operations.
3. Implementation of Factors.
4. Implementation of Quick Sort, Merge Sort.
5. Implementation of Binary Search Tree.
6. Implementation of Reading and Writing files.
7. Implementation of Descriptive and Summary Statistics.
8. Implement Charts- Bar(Side by Side, Stacked), Line.
9. Implementation of Correlation, T-test, ANOVA.
10. Implementation of Decision tree, Support Vector Classifications.
11. Implementation of Linear, Random Forest Regressions.
12. Implementation of Clustering.

TEXT BOOKS:

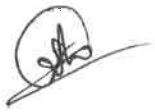
1. The Art of R Programming, Norman Matloff, Cengage Learning.
2. R for Everyone, Lander, Pearson.

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,RobKabacoff, Manning

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
2. https://nptel.ac.in/courses/111104100.
3. https://ict.iitk.ac.in/courses/r-programming-a-practical-approach/



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Course Code-Complier Design Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

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	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
CO2	To apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
CO3	To write the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO4	To employ the knowledge of modern compiler & its features.
CO5	To 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	--	3	--	--	--	--	--	--	
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	

List of Experiments

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
2.

TEXT BOOKS:

3. The Art of R Programming, Norman Matloff, Cengage Learning.
4. R for Everyone, Lander, Pearson.

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,RobKabacoff, Manning

E-Resources:

4. https://onlinecourses.nptel.ac.in/noc19_ma33/preview
5. https://nptel.ac.in/courses/111104100.
6. https://ict.iitk.ac.in/courses/r-programming-a-practical-approach/

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Course Title: MEAN STACK TECHNOLOGY -LAB

Lecture – Practical:	0-0-4	**Internal Marks:**	15
Credits	2	**External Marks:**	35

- **Prerequisites:**
- To have basic knowledge on developing web applications
- Knowing HTML and CSS web languages
- JavaScript, IDE or Text Editor, Command Line Interface (CLI)
- Server-side development with any programming language.

Course Objectives : The Objective of this course is to give a strong foundation of the Development and its Operations.

Course Outcomes

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

1.Understand the traditional software development.
2.Learn the rise of agile methodologies.
3.Define and design purpose of DevOps.

CO1	To code a MEAN Stack Application
CO2	Developing Single Page Applications (SPAs) via MEAN Stack
CO3	Setup routing within Angular & Express
CO4	Write Express Back-End Web Services with Express & Node
CO5	Employ Express Web Services
CO6	Understanding Mango DBMS

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-						3	-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-						3	2	2	-
CO4	3	3	2	-	-	-							-	2	3
CO5	2	2	3	2	2	2							1	3	-
CO6		3		3	3	3						3	3	3	3

List of Experments

- Angular :
- Getting Started with Angular
- Introduction to Components
- Templates, Interpolation, and Directives
- Data Binding & Pipes
- More on Components
- Building Nested Components
- Forms
- Services and Dependency Injection
- Retrieving Data Using HTTP

Navigation and Routing Basics

- Node Js :
- Introduction
- Exploring language additions to the V8 JavaScript engine
- Understanding NodeJS
- HTTP and File System
- Buffers, Streams, and Events
- Using Express Framework
- Working with Models, Views, and Routes
- Database
- Working with MongoDB
- Working with RESTful web services

Angular With Node

Course Title: EMPLOYABILITY SKILLS –II

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

Prerequisites: None

Course Objectives

- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes

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

CO1	Recite the corporate etiquette.
CO2	Make presentations effectively with appropriate body language
CO3	Be composed with positive attitude
CO4	Apply their core competencies to succeed in professional and personal life

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	PO12	PSO1	PSO2	PSO3
CO1	2			3			2			2		2	2		
CO2				3					2						2
CO3		3				2				3				3	
CO4				3					2	3		2	2		

UNIT I:
Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness

UNIT II:
Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips.
Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

UNIT III:
Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.

UNIT IV:
Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills.

UNIT V: Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence

Text Book:
1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.

REFERENCE BOOKS:
1) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
2) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
3) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
4) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
5) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

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PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH CSE (AI&ML) PROGRAMME

III YEAR I SEMESTER – B.Tech – CSE (AI & ML)

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	20A3142401	Big-data Analytics	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3242401	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A314260X	OE-1	2	0	2	4	30	70	100	3
5	20A314251X	PE-1	3	0	0	3	30	70	100	3
6	20A3142491	Operating systems & Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3142492	Big-data Analytics Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3142801	Employability Skills	2	0	0	2	30	70	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			16	0	12	28	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	4

Code	Professional Elective - 1
20A3142511	1.5 Compiler design
20A3142512	1.6 Internet of Things
20A3242402	1.7 Deep Learning and its Applications
20A3142514	1.8 Advanced Data Structures

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PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH CSE (AI&ML) PROGRAMME

III YEAR II SEMESTER – B.Tech – CSE (AI & ML)

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	20A3242402	Deep learning and its Applications	3	0	0	3	30	70	100	3
2	20A3205401	Cryptography and Network Security	3	0	0	3	30	70	100	3
3	20A3242401	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A324260X	OE-2	2	0	2	4	30	70	100	3
5	20A324251X	PE-2	3	0	0	3	30	70	100	3
6	20A3242493	Deep learning Lab	0	0	3	3	15	35	50	1.5
7	20A3242492	Cryptography and Network Security Lab	0	0	3	3	15	35	50	1.5
8	20A3242491	Algorithms Lab	0	0	3	3	15	35	50	1.5
9	20A3242991	MEAN stack Technologies	0	0	4	4	15	35	50	2
10	20A3242801	Employability Skills - 2	2	0	0	2	30	70	100	0
Total			16	0	15	31	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
20A3242511	2.1 Natural Language Processing
20A3242512	2.2 Intelligent Information Retrieval
20A3242513	2.3 Reinforcement Learning
20A3242514	2.4 Object Oriented Analysis and Design

H.O.D

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PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH CSE (DS) PROGRAMME

III YEAR I SEMESTER – B.Tech – 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/D	Total	CIA	SEA	Total	
1	20A3105402	Artificial Intelligence	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3142401	Operating System	3	0	0	3	30	70	100	3
4	20A314460X	OE-1	3	0	0	3	30	70	100	3
5	20A314451X	PE-1	3	0	0	3	30	70	100	3
6	20A3142491	Operating System & Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3144491	Artificial Intelligence Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3144801	Employability Skills-1	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			17	0	10	27	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective - 1
20A3144511	1.1. Compiler Design
20A3144512	1.2 Internet of Things
20A3144513	1.3 Data Warehousing and Data Mining
20A3144514	1.4 Advanced Data Structures

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PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH CSE (DS) PROGRAMME

III YEAR II SEMESTER – B.Tech – 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/D	Total	CIA	SEA	Total	
1	20A3244401	Data Visualization Techniques	3	0	0	3	30	70	100	3
2	20A3242401	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
3	20A3244402	Foundations of Data Science	3	0	0	3	30	70	100	3
4	20A324460X	OE-2	3	0	0	3	30	70	100	3
5	20A324451X	PE-2	3	0	0	3	30	70	100	3
6	20A3244492	Data Visualization Lab	0	0	3	3	15	35	50	1.5
7	20A3244491	Algorithms Lab	0	0	3	3	15	35	50	1.5
8	20A3242493	Advanced Data Science Lab	0	0	3	3	15	35	50	1.5
9	20A3242991	MEAN stack Technologies	0	0	4	4	15	35	50	2
10	20A3244801	Employability Skills - 2	2	0	0	2	30	70*	100	0
Total			17	0	13	30	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
20A3244511	2.1 Deep Learning and its Applications
20A3244512	2.2 Big Data Analytics
20A3244513	2.3 Predictive Analytics
20A3244514	2.4 Object Oriented Analysis and Design

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A.Y22 -23

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES

III YEAR – I SEMISTER CSE

Code	Professional Elective - 1
20A3105511	1.5 Cloud computing
20A3105512	1.6 Software Testing Methodologies and Tools
20A3105513	1.7 Data Warehousing and Data Mining
20A3105514	1.8 Advanced Data Structures

III YEAR – II SEMISTER CSE

Code	Professional Elective -2
20A3205511	2.1 Advanced Database Management Systems
20A3205512	2.2 Network Programming
20A3205513	2.3 Big data Analytics
20A3205514	2.4 Object Oriented Analysis and Design

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES

III YEAR – I SEMISTER CSE(AIML)

Code	Professional Elective - 1
20A3142511	1.1 Compiler design
20A3142512	1.2 Internet of Things
20A3242402	1.3 Deep Learning and its Applications
20A3142514	1.4 Advanced Data Structures

III YEAR – II SEMISTER

Code	Professional Elective -2
20A3242511	2.1 Natural Language Processing
20A3242512	2.2 Intelligent Information Retrieval
20A3242513	2.3 Reinforcement Learning
20A3242514	2.4 Object Oriented Analysis and Design

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
PROFESSIONAL ELECTIVES - NRIA20

III YEAR – I SEMISTER CSE(DS)

Code	Professional Elective - 1
20A3144511	1.1. Compiler Design
20A3144512	1.2 Internet of Things
20A3144513	1.3 Data Warehousing and Data Mining
20A3144514	1.4 Advanced Data Structures

III YEAR – II SEMISTER

Code	Professional Elective -2
20A3244511	2.1 Deep Learning and its Applications
20A3244512	2.2 Big Data Analytics
20A3244513	2.3 Predictive Analytics
20A3244514	2.4 Object Oriented Analysis and Design

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DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING
OPEN ELECTIVES (NRIA20)

III YEAR – I SEMISTER

Code	Open Elective -1
20A3105601	1.1 Data Structures

III YEAR – II SEMISTER

Code	Open Elective -2
20A3205602	2.1 OOPS through C++
20A3205603	2.2 Software Engineering

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III సంవత్సరం I సెమిస్టర్

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR I SEMESTER

క్ర.సం. నం	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	స్కీమ్ ఆఫ్ ఇన్‌స్ట్రక్షన్ (వారానికి పీరియడ్స్)				పరీక్షా విధానం (గరిష్ట మార్కులు)			క్రెడిట్స్ సంఖ్య
			ఎల్	టి	P/D	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A3105402	ఆర్టిఫిషియల్ ఇంటెలిజెన్స్	3	0	0	3	30	70	100	3
2	20A3105401	కంప్యూటర్ నెట్‌వర్క్‌లు	3	0	0	3	30	70	100	3
3	20A3105403	అల్గోరిథంల రూపకల్పన మరియు విశ్లేషణ	3	0	0	3	30	70	100	3
4	20A310560X	OE-1	3	0	0	3	30	70	100	3
5	20A310551X	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	కంప్యూటర్ నెట్‌వర్క్స్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A3105492	AI ప్రోగ్రామింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	ఉపాధి నైపుణ్యాలు-1	2	0	0	2	30	70*	100	0
రెండవ సంవత్సరం తర్వాత సమ్మర్ ఇంటర్న్‌షిప్ 2 నెలలు (తప్పనిసరి) (V సెమిస్టర్ సమయంలో మూల్యాంకనం చేయాలి)			0	0	0	0	30	70	100	1.5
మొత్తం			17	0	10	27	255	595	850	21.5
ఆనర్స్/మైనర్ కోర్సులు - 2			3	0	2	5	30	70	100	4

కోడ్	వృత్తిపరమైన ఎంపిక - 1
20A3105511	1.1 క్లౌడ్ కంప్యూటింగ్
20A3105512	1.2 సాఫ్ట్‌వేర్ టెస్టింగ్ మెథడాలజీస్ మరియు టూల్స్
20A3105513	1.3 డేటా వేర్‌హౌసింగ్ మరియు డేటా మైనింగ్
20A3105514	1.4 అడ్వాన్స్ డ్ డేటా స్ట్రక్చర్స్

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	

HOD

Smith

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డిపార్ట్‌మెంట్ ఆఫ్ కంప్యూటర్ సైన్స్ అండ్ ఇంజినీరింగ్

మూడవ సంవత్సరం B.TECH ప్రోగ్రామ్ కోసం ఉద్దేశించిన నిర్మాణం

III సంవత్సరం I సెమిస్టర్

DEPARTMENT OF COMUTER SCIENCE AND ENGINEERING

PRPOPSED STRUCTURE FOR THIRD YEAR B.TECH PROGRAMME

III YEAR I SEMESTER

క్ర.సం. నం	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	స్కీమ్ ఆఫ్ ఇన్‌స్ట్రక్షన్ (వారానికి పీరియడ్స్)				పరీక్షా విధానం (గరిష్ఠ మార్కులు)			క్రెడిట్స్ సంఖ్య
			ఎల్	టి	P/D	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A3105402	ఆర్టిఫిషియల్ ఇంటెలిజెన్స్	3	0	0	3	30	70	100	3
2	20A3105401	కంప్యూటర్ నెట్‌వర్క్‌లు	3	0	0	3	30	70	100	3
3	20A3105403	అల్గోరిథంల రూపకల్పన మరియు విశ్లేషణ	3	0	0	3	30	70	100	3
4	20A310560X	OE-1	3	0	0	3	30	70	100	3
5	20A310551X	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	కంప్యూటర్ నెట్‌వర్క్స్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A3105492	AI ప్రోగ్రామింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	ఉపాధి నైపుణ్యాలు-1	2	0	0	2	30	70*	100	0
రెండవ సంవత్సరం తర్వాత సమ్మర్ ఇంటర్న్‌షిప్ 2 నెలలు (తప్పనిసరి) (V సెమిస్టర్ సమయంలో మూల్యాంకనం చేయాలి)			0	0	0	0	30	70	100	1.5
మొత్తం			17	0	10	27	255	595	850	21.5
ఆనర్స్/మైనర్ కోర్సులు - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

కోడ్	వృత్తిపరమైన ఎంపిక - 1
20A3105511	1.1 క్లౌడ్ కంప్యూటింగ్
20A3105512	1.2 సాఫ్ట్‌వేర్ టెస్టింగ్ మెథడాలజీస్ మరియు టూల్స్
20A3105513	1.3 డేటా వేర్‌హౌసింగ్ మరియు డేటా మైనింగ్
20A3105514	1.4 అడ్వాన్స్‌డ్ డేటా స్ట్రక్చర్స్

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Sl. No	Course Code	Title of the Course	Scheme of Instruction (Periods Per Week)				Scheme of Examination (Maximum Marks)			No. of Credits
			L	T	P/D	Total	CIA	SEA	Total	
1	20A3105402	Artificial Intelligence	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3105403	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A310560X	OE-1	3	0	0	3	30	70	100	3
5	20A310551X	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3105492	AI Programming Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	Employability Skills-I	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			17	0	10	27	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective - 1
20A3105511	1.5 Cloud computing
20A3105512	1.6 Software Testing Methodologies and Tools
20A3105513	1.7 Data Warehousing and Data Mining
20A3105514	1.8 Advanced Data Structures

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III సంవత్సరం II సెమిస్టర్

క్ర.సం. నం	కోర్సు కోడ్	కోర్సు యొక్క శీర్షిక	స్కీమ్ ఆఫ్ ఇన్‌స్ట్రక్షన్ (వారానికి పీరియడ్స్)				పరీక్షా విధానం (గరిష్ట మార్కులు)			క్రెడిట్ల సంఖ్య
			ఎల్	టి	P/D	మొత్తం	CIA	సముద్ర	మొత్తం	
1	20A3205403	మెషిన్ లెర్నింగ్	3	0	0	3	30	70	100	3
2	20A3205402	కంపైలర్ డిజైన్	3	0	0	3	30	70	100	3
3	20A3205401	క్రిప్టోగ్రఫీ మరియు నెట్ వర్క్ సెక్యూరిటీ	3	0	0	3	30	70	100	3
4	20A320560X	OE-2	3	0	0	3	30	70	100	3
5	20A320551X	PE-2	3	0	0	3	30	70	100	3
6	20A3205491	మెషిన్ లెర్నింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
7	20A3205492	R ప్రోగ్రామింగ్ ల్యాబ్	0	0	3	3	15	35	50	1.5
8	20A3205493	కంపైలర్ డిజైన్ ల్యాబ్	0	0	3	3	15	35	50	1.5
9	20A3205991	మీన్ స్టాక్ టెక్నాలజీస్	0	0	4	4	15	35	50	2
10	20A3205801	ఉపాధి నైపుణ్యాలు - 2	2	0	0	2	30	70*	100	0
మొత్తం			17	0	13	30	240	560	800	21.5
ఆనర్స్/మైనర్ కోర్సులు - 3			3	0	2	5	30	70	100	4
పారిశ్రామిక/పరిశోధన ఇంటర్న్‌షిప్ (తప్పనిసరి) వేసవి సెలవుల్లో 2 నెలలు										

కోడ్	వృత్తిపరమైన ఎంపిక -2
20A3205511	2.1 అధునాతన డేటాబేస్ మేనేజ్ మెంట్ సిస్టమ్స్
20A3205512	2.2 నెట్‌వర్క్ ప్రోగ్రామింగ్
20A3205513	2.3 బిగ్ డేటా అనలిటిక్స్
20A3205514	2.4 ఆబ్జెక్ట్ ఓరియెంటెడ్ విశ్లేషణ మరియు డిజైన్

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/D	Total	CIA	SEA	Total	
1	20A3205403	Machine Learning	3	0	0	3	30	70	100	3
2	20A3205402	Compiler Design	3	0	0	3	30	70	100	3
3	20A3205401	Cryptography and Network Security	3	0	0	3	30	70	100	3
4	20A320560X	OE-2	3	0	0	3	30	70	100	3
5	20A320551X	PE-2	3	0	0	3	30	70	100	3
6	20A3205491	Machine Learning Lab	0	0	3	3	15	35	50	1.5
7	20A3205492	R Programming lab	0	0	3	3	15	35	50	1.5
8	20A3205493	Compiler Design Lab	0	0	3	3	15	35	50	1.5
9	20A3205991	MEAN Stack Technologies	0	0	4	4	15	35	50	2
10	20A3205801	Employability Skills - 2	2	0	0	2	30	70*	100	0

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Total	17	0	13	30	240	560	800	21.5
Honors/Minor courses - 3	**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation								

Code	Professional Elective -2
20A3205511	2.1 Advanced Database Management Systems
20A3205512	2.2 Network Programming
20A3205513	2.3 Big data Analytics
20A3205514	2.4 Object Oriented Analysis and Design

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కోర్సు శీర్షిక: ఆర్టిఫిషియల్ ఇంటెలిజెన్స్

ఉపన్యాసం–ట్యుటోరియల్–ప్రాక్టికల్::	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్:	3	బాహ్య గుర్తులు:	70

ముందస్తు అవసరాలు: ఏదీ లేదు

కోర్సు లక్ష్యాలు

- సరైన తార్కికం vs మానవుల వంటి తార్కికం మధ్య వ్యత్యాసాన్ని తెలుసుకోవడానికి
- సమయం మరియు స్థల సంక్లిష్టతలతో పాటు రాష్ట్ర అంతరిక్ష ప్రాతినిధ్యం, సమగ్ర శోధన, హ్యూరిస్టిక్ శోధన యొక్క భావాలను అర్థం చేసుకోవడానికి
- విభిన్న జ్ఞాన ప్రాతినిధ్య పద్ధతులను నేర్చుకోవడం
- AI యొక్క అనువర్తనాలను అర్థం చేసుకోవడానికి: అవి గేమ్ ప్లేయింగ్, థియరమ్ ప్రూవింగ్, ఎక్స్‌పర్ట్ సిస్టమ్స్, మెషిన్ లెర్నింగ్ మరియు నేచురల్ లాంగ్వేజ్ ప్రాసెసింగ్

కోర్సు ఫలితాలు:

కోర్సు పూర్తయిన తర్వాత, విద్యార్థులు చేయగలరు

CO1 ఆంగ్లంలో వ్యక్తీకరించబడిన సమస్య కోసం సమర్థవంతమైన సమస్య స్థలాన్ని రూపొందించే సామర్థ్యాన్ని కలిగి ఉంటుంది.

CO 2 సమస్య కోసం శోధన అల్గారిథమ్‌ను ఎంచుకునే సామర్థ్యాన్ని కలిగి ఉంటుంది మరియు దాని సమయం మరియు స్థల సంక్లిష్టతలను వర్గీకరిస్తుంది.

CO3 తగిన సాంకేతికతను ఉపయోగించి జ్ఞానాన్ని సూచించే నైపుణ్యాన్ని కలిగి ఉంటుంది

CO4 గేమ్ ప్లేయింగ్, ఎక్స్‌పర్ట్ సిస్టమ్స్, మెషిన్ లెర్నింగ్ మరియు నేచురల్ లాంగ్వేజ్ ప్రాసెసింగ్ సమస్యలను పరిష్కరించడానికి AI పద్ధతులను వర్తించే సామర్థ్యాన్ని కలిగి ఉంది.

CO5 నిజ జీవిత సమస్యలకు పరిష్కారాలను అభివృద్ధి చేయడానికి జ్ఞానాన్ని వర్తింపజేయండి CO6 పరిశోధనా రంగానికి సహకరించడానికి కొత్త అల్గారిథమ్‌లను అభివృద్ధి చేయండి

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2

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యూనిట్-I

పరిచయం, చరిత్ర, ఇంటెలిజెంట్ సిస్టమ్స్, AI యొక్క పునాదులు, AI యొక్క ఉప ప్రాంతాలు, అప్లికేషన్లు. సమస్య పరిష్కారం -స్టేట్-స్పేస్ శోధన మరియు నియంత్రణ వ్యూహాలు: పరిచయం, సాధారణ సమస్య పరిష్కారం, సమస్య యొక్క లక్షణాలు, సమగ్ర శోధనలు, హ్యూరిస్టిక్ సెర్చ్ టెక్నిక్స్, పునరుక్తి-డీపెనింగ్A*, నిర్బంధ సంతృప్తి

యూనిట్ II:

లాజిక్ కాన్సెప్ట్ మరియు లాజిక్ ప్రోగ్రామింగ్: పరిచయం, ప్రపోజిషనల్ కాలిక్యులస్, ప్రొపోజిషనల్ లాజిక్, నేచురల్ డిడక్షన్ సిస్టమ్, రిజల్యూషన్ రిఫ్యూటేషన్ ఇన్ ప్రొపోజిషనల్ లాజిక్, ప్రిడికేట్ లాజిక్, లాజిక్ ప్రోగ్రామింగ్. జ్ఞానానికి ప్రాతినిధ్యం వహించే నియమాలు: లాజిక్‌ప్రోగ్రామింగ్, ప్రొసీడ్యూరల్Vs డిక్లరేటివ్ నాలెడ్జ్, ఫార్వర్డ్Vs బ్యాక్‌వర్డ్ రీజనింగ్, మ్యాచింగ్, కంట్రోల్ నాలెడ్జ్

యూనిట్ III:

నాలెడ్జ్ రిప్రజెంటేషన్: పరిచయం, నాలెడ్జ్ ప్రాతినిధ్యానికి సంబంధించిన విధానాలు, సెమాంటిక్ నెట్‌వర్క్, ఎక్స్‌టెండెడ్ సెమాంటిక్ నెట్‌వర్క్‌ల కోసం కెఆర్ ఉపయోగించి నాలెడ్జ్ రిప్రజెంటేషన్, ఫ్రేమ్‌లు, కాన్సెప్చ్యువల్ డిపెండెన్సీలు, స్క్రిప్ట్‌లను ఉపయోగించి నాలెడ్జ్ రిప్రజెంటేషన్

యూనిట్ IV:

నేచురల్ లాంగ్వేజ్ ప్రాసెసింగ్: నేచురల్ లాంగ్వేజ్ ప్రాసెసింగ్, సింటాక్టిక్ ప్రాసెసింగ్ మరియు ఆగ్మెంటెడ్ ట్రాన్సిషన్ నెట్స్, సెమాంటిక్ ఎనాలిసిస్, ఎన్ఎల్పిఅండర్‌స్టాండింగ్ సిస్టమ్స్‌లో దశలు;
మసక తర్కం: క్రిస్ప్‌సెట్‌లు, మసక సెట్‌లు, అస్పష్టమైన లాజిక్ కంట్రోల్, అస్పష్టమైన అనుమితులు & అస్పష్టమైన సిస్టమ్‌లు స్టేట్-స్పేస్‌సెర్చ్-పాక్షిక-ఆర్డర్‌ప్లానింగ్-ప్లానింగ్‌గ్రాఫ్‌లతో ప్లాన్ చేయడం-అంతర్జాతీయంగా మరియు కార్యాచరణ

యూనిట్ V:

నిపుణుల వ్యవస్థలు: నిపుణుల వ్యవస్థ యొక్క అవలోకనం, నిపుణుల వ్యవస్థల నిర్మాణం, వివిధ రకాల నిపుణుల వ్యవస్థలు, ఆర్కిటెక్చర్‌లు, జ్ఞాన సముపార్జన మరియు ధ్రువీకరణ పద్ధతులు, నాలెడ్జ్ సిస్టమ్ బిల్డింగ్ టూల్స్, ఎక్స్‌పర్ట్‌సిస్టమ్ షెల్స్ లాగ్

టెక్స్ట్ బుక్:

1. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్, ఎలైన్ రిచ్ మరియు కెవిన్ నైట్, టాటా మెక్‌గ్రా-హిల్ పబ్లికేషన్స్
2. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్ & ఎక్స్‌పర్ట్ సిస్టమ్స్, పీటర్‌సన్, PHI ప్రచురణలకు పరిచయం

రిఫరెన్స్ పుస్తకాలు:

1. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్, జార్జ్ ఫ్లూగర్, పియర్సన్ ఎడ్యుకేషన్ పబ్లికేషన్స్
2. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్: అమోడర్స్ అప్రోచ్, రస్సెల్లాండ్ నార్విగ్, ప్రెంటీస్ హాల్
3. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్, రాబర్ట్ షాల్కోఫ్, మెక్‌గ్రా-హిల్ పబ్లికేషన్స్
4. ఆర్టిఫిషియల్ ఇంటెలిజెన్స్ అండ్ మెషిన్ లెర్నింగ్, వినోద్ చంద్ర ఎస్.ఎస్., ఆనంద్ హరీంద్రన్.

E-వనరులు

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://nptel.ac.in/courses/106105077
3. https://nptel.ac.in/courses/106102220
4. https://onlinecourses.nptel.ac.in/noc19_me71/preview
5. https://nptel.ac.in/courses/106106126

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An ISO 9001:2015 Certified Institution
Pothavarappadu (V), Agiripalli (M), Eluru District, A.P., India, Pin: 521 212
URL: www.nriit.edu.in, email: principal@nriit.edu.in, Mobile: + 91 8333882444

Course Title: Artificial Intelligence

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

Prerequisites: None

Course Objectives

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:
Upon 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

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	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2

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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, HeuristicSearchTechniques,Iterative-DeepeningA*,ConstraintSatisfaction

UNIT II:

LogicConceptsandLogicProgramming:Introduction,PropositionalCalculus,Propositional Logic,NaturalDeduction System, Resolution Refutation in Propositional Logic, Predicate Logic,Logic Programming. RepresentingKnowledgeUsingRules:Logicprogramming,ProceduralVsDeclarativeknowledge,Forward Vs Backward Reasoning, Matching,Control Knowledge

UNIT III:

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge RepresentationusingSemanticNetwork,ExtendedSemanticNetworksforKR, Knowledge Representation usingFrames,Conceptualdependencies,Scripts

UNIT IV:

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and AugmentedTransitionNets,SemanticAnalysis,NLPUnderstandingSystems;
Fuzzy Logic: CrispSets,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-spacesearch–partial-orderplanning–planninggraphs–planningandactingintherealworld

UNIT V:

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of ExpertSystems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools,ExpertSystemShells.AIProgramminglanguages:Overviewof LISPandPROLOG, ProductionSysteminProlog

Text Book:

3. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications
4. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

REFERENCE BOOKS:

5. ArtificialIntelligence,GeorgeFLuger,PearsonEducationPublications
6. ArtificialIntelligence: AmodernApproach,RussellandNorvig,PrenticeHall
7. ArtificialIntelligence,RobertSchalkoff,Mcgraw-HillPublications
8. ArtificialIntelligenceandMachineLearning,VinodChandraS.S.,AnandHareendranS.

E-RESOURCES

6. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
7. https://nptel.ac.in/courses/106105077
8. https://nptel.ac.in/courses/106102220
9. https://onlinecourses.nptel.ac.in/noc19_me71/preview
10. https://nptel.ac.in/courses/106106126

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కోర్సు శీర్షిక: కంప్యూటర్ నెట్‌వర్క్స

ఉపన్యాసం - ట్యుటోరియల్:	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్:	3	బాహ్య గుర్తులు:	70

అవసరమైనవి: కంప్యూటర్ నెట్‌వర్క్‌లు

కోర్సు లక్ష్యాలు:

- నెట్‌వర్క్ ప్రోటోకాల్‌లు, ఆర్కిటెక్చర్‌లు మరియు అప్లికేషన్‌లలో స్టేట్ ఆఫ్ ది ఆర్ట్‌ను అర్థం చేసుకోండి.
- నెట్‌వర్కింగ్ పరిశోధన ప్రక్రియ
- నెట్‌వర్కింగ్ పరిశోధన కోసం పరిమితులు మరియు ఆలోచన ప్రక్రియలు
- సమస్య సూత్రీకరణ-విధానం---విశ్లేషణ

కోర్సు ఫలితాలు:

CO1	OSI మరియు TCP/IP మోడల్‌లను అర్థం చేసుకోగలుగుతారు.
CO2	డేటా లింక్ లేయర్ ప్రోటోకాల్‌లు మరియు ఫ్లో నియంత్రణను అర్థం చేసుకోండి
CO3	రూటింగ్ మరియు నెట్‌వర్క్ లేయర్ ప్రోటోకాల్‌లు మరియు IPV4ని అర్థం చేసుకోండి
CO4	రవాణా పొర రద్దీ, ప్రవాహ నియంత్రణ మరియు ప్రోటోకాల్‌లను అర్థం చేసుకోండి
CO5	అప్లికేషన్ లేయర్ ప్రోటోకాల్‌లను అర్థం చేసుకోండి

యూనిట్ I : పరిచయం

OSI, TCP/IP మరియు ఇతర నెట్‌వర్క్‌ల నమూనాలు, నెట్‌వర్క్‌ల ఉదాహరణలు: నోవెల్ నెట్‌వర్క్‌లు, అర్పానెట్, ఇంటర్నెట్, నెట్‌వర్క్ టోపోలాజీలు WAN, LAN, MAN.

ఫిజికల్ లేయర్ ట్రాన్స్‌మిషన్ మీడియా కాపర్, ట్విస్టెడ్ పెయిర్ వైర్‌లెస్, ఎసిన్క్రోనస్ కమ్యూనికేషన్‌లను మార్చడం మరియు ఎన్‌కోడింగ్ చేయడం

యూనిట్ II: డేటా లింక్ లేయర్:

డిజైన్ సమస్యలు, ఫ్రేమింగ్, ఎర్రర్ డిటెక్షన్ మరియు కరెక్షన్, CRC, ఎలిమెంటరీ ప్రోటోకాల్-స్టాప్ అండ్ వెయిట్, స్లైడింగ్ విండో. మీడియం యాక్సెస్ సబ్ లేయర్: ALOHA, MAC చిరునామాలు, క్యారియర్ సెన్స్ మల్టిపుల్ యాక్సెస్, IEEE 802.X స్టాండర్డ్ ఈథర్నెట్, బ్రిడ్జ్‌లు.

యూనిట్ III: నెట్‌వర్క్ లేయర్

వర్చువల్ సర్క్యూట్ మరియు డేటాగ్రామ్ సబ్‌నెట్‌లు-రూటింగ్ అల్గోరిథం షార్ట్ పాత్ రూటింగ్, ఫ్లడింగ్, హైరార్కికల్ రూటింగ్, బ్రాడ్ కాస్ట్, మల్టీ కాస్ట్, డిస్టెన్స్ వెక్టార్ రూటింగ్. OSPF. IPV4

యూనిట్ IV ట్రాన్స్‌పోర్ట్ లేయర్

రవాణా సేవలు, కనెక్షన్ నిర్వహణ, TCP మరియు UDP ప్రోటోకాల్స్ రద్దీ నియంత్రణ.

యూనిట్ V అప్లికేషన్ లేయర్

నెట్‌వర్క్ సెక్యూరిటీ, డొమైన్ నేమ్ సిస్టమ్, SNMP, ఎలక్ట్రానిక్ మెయిల్; వరల్డ్ వెబ్, మల్టీ మీడియా.

టెక్స్ట్ బుక్:

1. టానెన్‌బామ్ మరియు డేవిడ్ J వెథెరాల్, కంప్యూటర్ నెట్‌వర్క్స్, 5 వ ఎడిషన్, పియర్సన్ ఎడు, 2010.

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రిఫరెన్స్ పుస్తకాలు:

1. కంప్యూటర్ నెట్‌వర్క్‌లు: ఎ టాప్-డౌన్ అప్రోచ్, బెహ్రూజ్ ఎ. ఫోరౌజాన్, ఫిరౌజ్ మోషారఫ్, మెక్‌గ్రా హిల్ ఎడ్యుకేషన్.

కంప్యూటర్ నెట్‌వర్క్స్, 5ed, డేవిడ్ ప్యాటర్సన్, ఎల్సెవియర్.

2. లారీ L. పీటర్సన్ మరియు బ్రూస్ S. డేవి, "కంప్యూటర్ నెట్‌వర్క్స్- ఎ సిస్టమ్స్ అప్రోచ్" 5 వ ఎడిషన్, మోర్గాన్ కౌఫ్‌మాన్/ఎల్సెవియర్, 2011.
3. కంప్యూటర్ నెట్‌వర్క్స్, మయాంక్ డేవ్, CENGAGE.
4. A n ఇంజినీరింగ్ అప్రోచ్ టు కంప్యూటర్ నెట్‌వర్క్స్-S.కేశవ్, 2వ ఎడిషన్, పియర్సన్ ఎడ్యుకేషన్.
5. కమ్యూనికేషన్స్ మరియు నెట్‌వర్క్‌లను అర్థం చేసుకోవడం, 3వ ఎడిషన్, WA షే, థామ్సన్

E-వనరులు

1. www.tutorialspoint.com
2. nptl.ac.in/courses/

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Course Title: Computer Networks

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

Prerequisites: Computer Networks

Course Objectives:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach---Analysis

Course Outcomes:

CO1	Able to understand OSI and TCP/IP models.
CO2	Understand data link layer protocols and flow control
CO3	Understand routing and network layer protocols and IPV4
CO4	Understand transport layer congestion, flow control and protocols
CO5	Understand application layer protocols

UNIT I : INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

PHYSICAL LAYER Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications

UNIT II: DATA LINK LAYER:

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, Bridges.

UNIT III: NETWORK LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. OSPF. IPV4

UNIT IV TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols congestion control.

UNIT V APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

Text Book:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu, 2010.

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REFERENCE BOOKS:

6. Computer Networks: A Top-Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education.
7. Computer Networks, 5ed, David Patterson, Elsevier.
8. Larry L. Peterson and Bruce S. Davie, "Computer Networks- A Systems Approach" 5th Edition, Morgan Kaufmann/Elsevier, 2011.
9. Computer Networks, Mayank Dave, CENGAGE.
10. An Engineering Approach to Computer Networks-S.Keshav, 2nd Edition, Pearson Education.
11. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

E-RESOURCES

3. www.tutorialspoint.com
4. nptl.ac.in/courses/

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కోర్సు శీర్షిక: అల్గారిథమ్‌ల రూపకల్పన మరియు విశ్లేషణ

ఉపన్యాసం-ట్యుటోరియల్-ప్రాక్టికల్::	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్:	3	బాహ్య గుర్తులు:	70

ముందస్తు అవసరాలు: ఏదీ లేదు

కోర్సు లక్ష్యాలు

- అల్గారిథమ్‌లు మరియు భాగాల అసింప్టోటిక్ పనితీరును విశ్లేషించండి
- అల్గారిథమ్‌లను విశ్లేషించడానికి మరియు రూపొందించడానికి ఉపయోగించే డివైడ్ అండ్ కాంక్వెర్ పారాడిగ్మ్ విధానాన్ని అధ్యయనం చేయడానికి
- అల్గారిథమ్‌లను విశ్లేషించడానికి మరియు రూపొందించడానికి ఉపయోగించే అత్యాశ పద్ధతి విధానాన్ని అధ్యయనం చేయడానికి.
- డైనమిక్ ప్రోగ్రామింగ్ నమూనాను అధ్యయనం చేయడానికి, అల్గారిథమ్‌లను విశ్లేషించడానికి మరియు రూపొందించడానికి ఉపయోగించే బ్యాక్‌ట్రాకింగ్ విధానం
- అల్గారిథమ్‌లను విశ్లేషించడానికి మరియు రూపొందించడానికి ఉపయోగించే బ్యాక్‌ట్రాకింగ్ విధానాన్ని అధ్యయనం చేయడానికి
- అల్గారిథమ్‌లను విశ్లేషించడానికి మరియు రూపొందించడానికి ఉపయోగించే బ్రాంచ్ మరియు బౌండ్ పారాడిగ్మ్ మరియు డిటర్మినిస్టిక్ విధానాన్ని అధ్యయనం చేయడానికి

కోర్సు ఫలితాలు:
కోర్సు పూర్తయిన తర్వాత, విద్యార్థులు చేయగలరు

CO1:అసింప్టోటిక్ విశ్లేషణ మరియు భాగాలను ఉపయోగించి అల్గారిథమ్‌ల యొక్క చెత్త-కేస్ రన్నింగ్ టైమ్‌లను విశ్లేషించండి

CO2: అల్గారిథమిక్ డిజైన్ పరిస్థితి ఎప్పుడు డిమాండ్ చేస్తుందో వివరించే డివైడ్ అండ్ కాంకర్ పద్ధతిని వివరించండి.

CO3: అల్గారిథమిక్ డిజైన్ పరిస్థితి ఎప్పుడు డిమాండ్ చేస్తుందో అత్యాశ పద్ధతిని వివరించండి.

CO4: డైనమిక్-ప్రోగ్రామింగ్ నమూనాను అల్గారిథమిక్ డిజైన్ ఎప్పుడు డిమాండ్ చేస్తుందో వివరించండి.

CO5: ఒక అల్గారిథమిక్ డిజైన్ ఎప్పుడు డిమాండ్ చేస్తుందో వివరించే బ్యాక్ ట్రాకింగ్ పద్ధతిని వివరించండి

CO6: ఒక అల్గారిథమిక్ డిజైన్ కోరినప్పుడు బ్రాంచ్ మరియు బౌండ్ పారాడిగ్మ్ మరియు డిటర్మినిస్టిక్ మెథడ్స్ ఇ-ప్లెయిన్‌ని వివరించండి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2
CO6	3	-	3	3	-	-	-	-	-	-	-	-	3	3	3

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UNIT I అల్గారిథమ్‌లకు పరిచయం అల్గారిథమిక్ సమస్య పరిష్కారం యొక్క ప్రాథమిక అంశాలు – విశ్లేషణ ఫ్రేమ్‌వర్క్ - పనితీరు విశ్లేషణ: - స్పేస్ సంక్లిష్టత, సమయ సంక్లిష్టత - ఫంక్షన్ల పెరుగుదల: అసింప్టోటిక్ సంజ్ఞామానం- పెద్ద ఓహ్ సంజ్ఞామానం, ఒమేగా సంజ్ఞామానం, తీటా సంజ్ఞామానం, కొద్దిగా ఓహ్.
UNIT II విభజించి జయించండి: విభజించి జయించండి: సాధారణ పద్ధతి, అప్లికేషన్లు-బైనరీ శోధన, త్వరిత క్రమబద్ధీకరణ, విలీన క్రమబద్ధీకరణ, గరిష్ట మరియు కనిష్టాన్ని కనుగొనడం
యూనిట్ III **అత్యాశ పద్ధతి:** సాధారణ పద్ధతి, నాప్‌సాక్ సమస్య, గడువుతో జాబ్ సీక్వెన్సింగ్, కనిష్ట-వ్యయం స్పేనింగ్ ట్రీస్, ప్రిమ్స్ అల్గోరిథం, క్రుస్కాల్ యొక్క అల్గారిథమ్స్, ఆప్టిమల్ మెర్జ్ ప్యాటర్న్స్, సింగిల్ సోర్స్ షార్టెస్ట్ పాత్‌లు
UNIT IV డైనమిక్ ప్రోగ్రామింగ్: సాధారణ పద్ధతి, అప్లికేషన్‌లు-మ్యాట్రిక్స్ చైన్ మల్టిప్లికేషన్, ఆప్టిమల్ బైనరీ సెర్చ్ ట్రీలు, 0/1నాప్‌సాక్ సమస్య, అన్ని జతల షార్టెస్ట్ పాత్ సమస్య, ట్రావెలింగ్ సేల్స్ పర్సన్ సమస్య, విశ్వసనీయత డిజైన్.
UNIT V బ్యాక్‌ట్రాకింగ్: సాధారణ పద్ధతి, అప్లికేషన్‌లు-n-క్వీన్ సమస్య, ఉపసమితుల మొత్తం సమస్య, గ్రాఫ్ కలరింగ్, హామిల్టోనియన్ సైకిల్స్. **బ్రాంచ్ మరియు బౌండ్:** సాధారణ పద్ధతి, అప్లికేషన్‌లు - ట్రావెలింగ్ సేల్స్ పర్సన్ సమస్య, 0/1 నాప్‌సాక్ సమస్య- LC బ్రాంచ్ మరియు బౌండ్ సొల్యూషన్, FIFO బ్రాంచ్ మరియు బౌండ్ సొల్యూషన్
టెక్స్ట్ పుస్తకాలు:
ఫండమెంటల్స్ ఆఫ్ కంప్యూటర్ అల్గారిథమ్స్, ఎల్లిస్ హోరోవిట్జ్, సత్రాజ్ సాహ్ని మరియు రాజశేఖరన్, యూనివర్సిటీ ప్రెస్
రిఫరెన్స్ పుస్తకాలు:
1. అల్గారిథమ్స్ రూపకల్పన మరియు విశ్లేషణకు పరిచయం, 3వ ఎడిషన్, అనానీ లెవిటిన్, పియర్సన్ ఎడ్యుకేషన్, 2017. 2. అల్గారిథమ్స్ పరిచయం, రెండవ ఎడిషన్, THCormen, CELeiserson, RL Rivest, మరియు C.Stein, PHI Pvt. Ltd./ పియర్సన్ ఎడ్యుకేషన్ 3. అల్గోరిథంల రూపకల్పన మరియు విశ్లేషణ, అహో, ఉల్మాన్ మరియు హాప్‌క్రాఫ్ట్, పియర్సన్ విద్య. 4. అల్గోరిథంలు – రిచర్డ్ జాన్సన్ బాగ్ మరియు మార్కస్ స్కేఫర్, పియర్సన్ ఎడ్యుకేషన్

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Course Title: Design and Analysis of Algorithms

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

Prerequisites: None

Course Objectives

- 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 Completion of the course, the students 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	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2
CO6	3	-	3	3	-	-	-	-	-	-	-	-	3	3	3

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.

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UNIT II Divide and Conquer: Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Finding the Maximum and Minimum
Unit III **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 IV 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 V 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
TEXT BOOKS:
Fundamentals of Computer Algorithms, Ellis Horowitz, SatrajSahni and Rajasekaran, University press
REFERENCE BOOKS:
5. Introduction to The Design and Analysis of Algorithms, 3rd Edition, Anany Levitin, Pearson Education, 2017. 6. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L. Rivest, and C.Stein, PHI Pvt. Ltd./ Pearson Education 7. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education. 8. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education

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కోర్స్ కోడ్- క్లౌడ్ కంప్యూటింగ్

ఉపన్యాసం – ట్యుటోరియల్- ప్రాక్టికల్::	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్:	3	బాహ్య గుర్తులు:	70

అవసరమైనవి: సి- ప్రోగ్రామింగ్, డేటా స్ట్రక్చర్స్, స్టాటిస్టిక్స్ ఫండమెంటల్స్

కోర్సు లక్ష్యాలు:

Iaas, Paas, Saas మరియు క్లౌడ్ ప్లాట్‌ఫారమ్‌ల పైన క్లౌడ్ ఆధారిత సాఫ్ట్‌వేర్ అప్లికేషన్‌లను అభివృద్ధి చేయడం వంటి వివిధ క్లౌడ్ సర్వీస్ మోడల్‌లలో ఆధునిక ఇంటర్నెట్ క్లౌడ్ కాన్సెప్ట్‌ల సామర్థ్యాలలో మిలియన్ల మంది వినియోగదారులకు స్కేల్ చేసే క్లౌడ్ పర్యావరణం, సాఫ్ట్‌వేర్ సిస్టమ్‌లు మరియు భాగాలను రూపొందించడం గురించి విద్యార్థి నేర్చుకుంటారు. .

కోర్సు ఫలితాలు:

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	క్లౌడ్ కంప్యూటింగ్ యొక్క సవాలు యొక్క ముఖ్య పరిమాణాలను అర్థం చేసుకోవడం
CO2	సొంత సంస్థ కోసం క్లౌడ్ కంప్యూటింగ్‌ని ఎంచుకోవడానికి ఆర్థిక శాస్త్రం, ఆర్థిక మరియు సాంకేతికపరమైన చిక్కుల అంచనా
CO3	క్లౌడ్-ఆధారిత అప్లికేషన్‌లను చురుకుగా ప్రారంభించడం మరియు ఇన్‌స్టాల్ చేయడం కోసం యజమాని యొక్క ఆర్థిక, సాంకేతిక మరియు సంస్థాగత సామర్థ్యాన్ని అంచనా వేయడం
CO4	క్లౌడ్ కంప్యూటింగ్-సంబంధిత IT ప్రాంతాలలో సామర్థ్యం పెంపుదల మరియు శిక్షణ కోసం సొంత సంస్థల అవసరాలను అంచనా వేయడం
CO5	వనరుల నిర్వహణ వ్యవస్థల లక్షణాలను వివరించండి

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం (1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

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

UNIT-1: సిస్టమ్స్ మోడలింగ్, క్లస్టరింగ్ మరియు వర్చువలైజేషన్ ఇంటర్నెట్ ద్వారా స్కేలబుల్ కంప్యూటింగ్, నెట్‌వర్క్ ఆధారిత సిస్టమ్‌ల కోసం సాంకేతికతలు, డిస్ట్రిబ్యూటెడ్ మరియు క్లౌడ్ కంప్యూటింగ్ కోసం సిస్టమ్ మోడల్స్, పంపిణీ చేయబడిన సిస్టమ్‌లు మరియు క్లౌడ్‌ల కోసం సాఫ్ట్‌వేర్ పరిసరాలు, పనితీరు, భద్రత మరియు శక్తి సామర్థ్యం

UNIT-2: వర్చువలైజేషన్ యొక్క అమలు స్థాయిలు, వర్చువలైజేషన్ స్ట్రక్చర్స్/టూల్స్ మరియు మెకానిజమ్స్, CPU యొక్క వర్చువలైజేషన్, మెమరీ మరియు I/O పరికరాలు, వర్చువల్ క్లస్టర్‌లు మరియు రిసోర్స్ మేనేజ్‌మెంట్, డేటా సెంటర్ ఆటోమేషన్ కోసం వర్చువలైజేషన్.

UNIT-3: క్లౌడ్ కంప్యూటింగ్ మరియు సర్వీస్ మోడల్స్, ఆర్కిటెక్చరల్ డిజైన్ ఆఫ్ కంప్యూట్ మరియు స్టోరేజ్ క్లౌడ్స్, పబ్లిక్ క్లౌడ్ ప్లాట్‌ఫారమ్‌లు, ఇంటర్ క్లౌడ్ రిసోర్స్ మేనేజ్‌మెంట్, క్లౌడ్ సెక్యూరిటీ అండ్ ట్రస్ట్ మేనేజ్‌మెంట్. సర్వీస్ ఓరియెంటెడ్ ఆర్కిటెక్చర్, మెసేజ్ ఓరియెంటెడ్ మిడిల్‌వేర్.

UNIT-4 : క్లౌడ్ మరియు గ్రిడ్ ప్లాట్‌ఫారమ్‌ల క్లౌడ్ ప్రోగ్రామింగ్ మరియు సాఫ్ట్‌వేర్ ఎన్విరాన్‌మెంట్స్ ఫీచర్లు, సమాంతర & పంపిణీ చేయబడిన ప్రోగ్రామింగ్ నమూనాలు, Google యాప్ ఇంజిన్‌కి ప్రోగ్రామింగ్ సపోర్ట్, Amazon AWS మరియు Microsoft Azureలో ప్రోగ్రామింగ్, ఎమర్జింగ్ క్లౌడ్ సాఫ్ట్‌వేర్ ఎన్విరాన్‌మెంట్స్.

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UNIT-5: పాలసీలు మరియు మెకానిజమ్స్ రిసోర్స్ మేనేజ్‌మెంట్ అప్లికేషన్స్ ఆఫ్ కంట్రోల్ థియరీ టు టాస్క్ షెడ్యూలింగ్ ఆన్ క్లౌడ్, స్టెబిలిటీ ఆఫ్ ఎ టూ లెవెల్ రిసోర్స్ అలోకేషన్ ఆర్కిటెక్చర్, ఫీడ్‌బ్యాక్ కంట్రోల్ ఆధారిత డైనమిక్ ప్రొవిజనింగ్స్. స్పెషలైజ్డ్ అటానమిక్ పెర్ఫార్మెన్స్ మేనేజర్‌ల సమన్వయం, రిసోర్స్ బండ్లింగ్, కంప్యూటింగ్ క్లౌడ్స్ కోసం షెడ్యూలింగ్ అల్గారిథమ్‌లు, ఫెయిర్ క్యూయింగ్, స్టార్ట్ టైమ్ ఫెయిర్ క్యూయింగ్, అరువు తెచ్చుకున్న వర్చువల్ టైమ్, క్లౌడ్ షెడ్యూల్ డెడ్‌లైన్‌లకు లోబడి, మ్యాప్‌రిడ్యూస్ అప్లికేషన్స్ సబ్‌సెట్‌కు షెడ్యూల్ చేయడం.

టెక్స్ట్ పుస్తకాలు:

1. డిస్ట్రిబ్యూటెడ్ మరియు క్లౌడ్ కంప్యూటింగ్, కై హ్వాంగ్, జియోఫ్రీ సి. ఫాక్స్, జాక్ జె. డొంగర్రా ఎంకె ఎల్సెవియర్.
2. క్లౌడ్ కంప్యూటింగ్, థియరీ అండ్ ప్రాక్టీస్, డాన్ సి మారినెస్కు, MK ఎల్సెవియర్.
3. క్లౌడ్ కంప్యూటింగ్, ఎ హ్యాండ్స్ ఆన్ అప్రోచ్, అర్షదీప్ బాగా, విజయ్ మాడిశెట్టి, యూనివర్సిటీ ప్రెస్

రిఫరెన్స్ పుస్తకాలు:

1. క్లౌడ్ కంప్యూటింగ్, ఎ ప్రాక్టికల్ అప్రోచ్, ఆంథోనీ టి వెల్చే, టోబి జె వెల్చే, రాబర్ట్ ఎల్సెన్‌పీటర్, TMH
2. మాస్టరింగ్ క్లౌడ్ కంప్యూటింగ్, ఫౌండేషన్స్ అండ్ అప్లికేషన్ ప్రోగ్రామింగ్, రాజ్ కుమార్ బుయ్య, క్రిస్టైన్ వెక్టియోలా, S తమ్మరైసెల్వి, TMH

ఇ-వనరులు:

1. **https://nptel.ac.in**
2. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

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An ISO 9001:2015 Certified Institution
Pothavarappadu (V), Agiripalli (M), Eluru District, A.P., India, Pin: 521 212
URL: www.nriit.edu.in. email: principal@nriit.edu.in. Mobile: + 91 8333882444

Course Code-Cloud Computing

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

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

Course Objectives:

The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Course Outcomes:

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

CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
CO5	Describe the features of Resource Management systems

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

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

UNIT-1: 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

UNIT-2: 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-3: 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.

UNIT-4 :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-5: Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

TEXT BOOKS:

4. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
5. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
6. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

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REFERENCE BOOKS:

3. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
4. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

e-Resources:

3. **https://nptel.ac.in**
4. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

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కోర్సు శీర్షిక: సాఫ్ట్‌వేర్ టెస్టింగ్ మెథడాలజీస్ మరియు టూల్స్

ఉపన్యాసం - ప్రాక్టికల్:	3-0-0	**అంతర్గత మార్కులు:**	30
క్రెడిట్స్	3	**బాహ్య గుర్తులు:**	70

అవసరమైనవి: సాఫ్ట్‌వేర్ ఇంజనీరింగ్

కోర్సు లక్ష్యాలు

వివిధ పరీక్షా పద్ధతులకు ప్రాథమిక అంశాలు.
- పరీక్ష కేసుల రూపకల్పనకు సంబంధించిన సూత్రాలు మరియు విధానాలను వివరించండి.
- డీబగ్గింగ్ పద్ధతులకు మద్ధతును అందించండి.
- సాఫ్ట్‌వేర్ పరీక్ష పద్ధతులు మరియు వ్యూహాలకు సూచనగా పనిచేస్తుంది.

కోర్సు ఫలితాలు

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	ప్రాథమిక పరీక్ష విధానాలను అర్థం చేసుకోండి.
CO2	పరీక్ష కేసులు మరియు టెస్ట్ సూట్‌లను రూపొందించడంలో సపోర్ట్ చేయగలదు.
CO3	విభిన్న పరీక్షా పద్ధతులు మరియు ఆటోమేషన్ సాధనాలను వర్తింపజేయడం ద్వారా అప్లికేషన్‌లను మాన్యువల్‌గా పరీక్షించవచ్చు. .
CO4	రియల్ టైమ్ వాతావరణంలో సమస్యలను పరిష్కరించడానికి సాధనాలను వర్తింపజేయండి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-							-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-							2	2	-
CO4	3	3	2	-	-	-							-	2	3

యూనిట్ I: పరిచయం: పరీక్ష యొక్క ఉద్దేశ్యం, డైకోటోమీస్, టెస్టింగ్ కోసం నమూనా, బగ్‌ల పరిణామాలు, బగ్‌ల వర్గీకరణ. ఫ్లో గ్రాఫ్‌లు మరియు పాత్ టెస్టింగ్: పాత్ టెస్టింగ్ యొక్క బేసిక్స్ కాన్సెప్ట్స్, ప్రిడికేట్స్, పాత్ ప్రిడికేట్స్ మరియు అచీవబుల్ పాత్స్, పాత్ సెన్సిటైజింగ్, పాత్ ఇన్‌స్ట్రుమెంటేషన్, పాత్ టెస్టింగ్ అప్లికేషన్.

యూనిట్ II:

ట్రాన్సాక్షన్ ఫ్లో టెస్టింగ్: ట్రాన్సాక్షన్ ఫ్లోస్, ట్రాన్సాక్షన్ ఫ్లో టెస్టింగ్ టెక్నిక్స్. డేటాఫ్లో టెస్టింగ్: డేటాఫ్లో టెస్టింగ్ బేసిక్స్, డేటాఫ్లో టెస్టింగ్‌లో వ్యూహాలు, డేటాఫ్లో టెస్టింగ్ అప్లికేషన్.
డొమైన్ టెస్టింగ్: డొమైన్‌లు మరియు మార్గాలు, నైస్ & అగ్లీ డొమైన్‌లు, డొమైన్ టెస్టింగ్, డొమైన్‌లు మరియు ఇంటర్‌ఫేస్‌ల టెస్టింగ్, డొమైన్ మరియు ఇంటర్‌ఫేస్ టెస్టింగ్, డొమైన్‌లు మరియు టెస్టింగ్

యూనిట్ III: . పాత్‌లు, పాత్ ఉత్పత్తులు మరియు రెగ్యులర్ ఎక్స్‌ప్రెషన్‌లు: పాత్ ప్రొడక్ట్‌లు & పాత్ ఎక్స్‌ప్రెషన్, రిడక్షన్ ప్రొసీజర్, అప్లికేషన్‌లు, రెగ్యులర్ ఎక్స్‌ప్రెషన్‌లు & ఫ్లో అనోమలీ డిటెక్షన్.
సింటాక్స్ టెస్టింగ్: ఎందుకు, ఏమిటి మరియు ఎలా, ఫార్మాట్‌ల కోసం ఒక గ్రామర్, టెస్ట్ కేస్ జనరేషన్, అమలు మరియు అప్లికేషన్ మరియు టెస్టబిలిటీ చిట్కాలు

యూనిట్ IV: . లాజిక్ బేస్డ్ టెస్టింగ్: ఓవర్‌వ్యూ, డెసిషన్ టేబుల్స్, పాత్ ఎక్స్‌ప్రెషన్స్, కెవి చార్ట్‌లు మరియు స్పెసిఫికేషన్‌లు.

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రాష్ట్రం, రాష్ట్ర గ్రాఫ్‌లు మరియు ట్రాన్సిషన్ టెస్టింగ్: స్టేట్ గ్రాఫ్‌లు, గుడ్ & బ్యాడ్ స్టేట్ గ్రాఫ్‌లు, స్టేట్ టెస్టింగ్ మరియు టెస్టిబిలిటీ చిట్కాలు.

యూనిట్ V: సాఫ్ట్‌వేర్ టెస్టింగ్ టూల్స్: టెస్టింగ్ పరిచయం, ఆటోమేటెడ్ టెస్టింగ్, టెస్ట్ ఆటోమేషన్ కాన్సెప్ట్‌లు, విన్ రన్నర్, లోడ్ రన్నర్, జెమీటర్, ఎబౌట్ విన్ రన్నర్ వంటి సాధనాల జాబితా పరిచయం టెస్ట్, చెక్‌పాయింట్‌లు, టెస్ట్ స్క్రిప్ట్ లాంగ్వేజ్, అన్నింటినీ కలిపి ఉంచడం, రన్నింగ్ మరియు డీబగ్గింగ్ టెస్ట్‌లు, ఫలితాలు విశ్లేషించడం, బ్యాచ్ టెస్ట్‌లు, రాపిడ్ టెస్ట్ స్క్రిప్ట్ విజార్డ్.

టెక్స్ట్ బుక్

1. సాఫ్ట్‌వేర్ పరీక్ష పద్ధతులు - బోరిస్ బీజర్, డ్రీమ్‌టెక్, రెండవ ఎడిషన్.
2. సాఫ్ట్‌వేర్ టెస్టింగ్- యోగేష్ సింగ్, కేంబ్రిడ్జ్

రిఫరెన్స్ పుస్తకాలు:

సాఫ్ట్‌వేర్ టెస్టింగ్ యొక్క క్రాఫ్ట్ - బ్రియాన్ మారిక్, పియర్సన్ ఎడ్యుకేషన్.
2. సాఫ్ట్‌వేర్ టెస్టింగ్, 3వ ఎడిషన్, PC జోర్గెన్‌సెన్, ఔర్బాచ్ పబ్లికేషన్స్ (Dist.by SPD).
3. సాఫ్ట్‌వేర్ టెస్టింగ్, ఎన్.చౌహాన్, ఆక్స్‌ఫర్డ్ యూనివర్సిటీ ప్రెస్.
4. సాఫ్ట్‌వేర్ టెస్టింగ్ పరిచయం, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. సాఫ్ట్‌వేర్ టెస్టింగ్ యొక్క ప్రభావవంతమైన పద్ధతులు, పెర్రీ, జాన్ విలే, 2వ ఎడిషన్, 1999.
6. సాఫ్ట్‌వేర్ టెస్టింగ్ కాన్సెప్ట్స్ అండ్ టూల్స్, పి.నాగేశ్వరరావు, డ్రీమ్‌టెక్ ప్రెస్
7. హకీమ్ షిట్ము, 2007Genixpress ద్వారా సింపుల్ స్టెప్స్‌లో రన్నర్‌ను గెలుచుకోండి.
8. సాఫ్ట్‌వేర్ టెస్టింగ్ యొక్క పునాదులు, D.గ్రహ & ఇతరులు, Cengage లెర్నింగ్.

ఇ -రిసోర్సెస్

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Pothavarappadu (V), Agiripalli (M), Eluru District, A.P., India, Pin: 521 212
URL: www.nriit.edu.in. email: principal@nriit.edu.in. Mobile: + 91 8333882444

Course Title: Software Testing Methodologies and Tools

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

Prerequisites: Software Engineering

Course Objectives

Fundamentals for various testing methodologies.

- 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	Understand the basic testing procedures.
CO2	Able to support in generating test cases and test suites.
CO3	Able to test the applications manually by applying different testing methods and automation tools..
CO4	Apply tools to resolve the problems in Real time environment.

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

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-							-	-	2
CO2	3	2	2	2	-	-							-	3.	2
CO3	2	2	3	2	-	-							2	2	-
CO4	3	3	2	-	-	-							-	2	3

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.

UNIT II:

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques. Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability

UNIT III:. Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips

UNIT IV:. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

UNIT V: Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording

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Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

Text Book

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

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

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కోర్సు శీర్షిక: డేటా వేర్‌హౌసింగ్ మరియు డేటా మైనింగ్

ఉపన్యాసం - ప్రాక్టికల్:	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్	3	బాహ్య గుర్తులు:	70

అవసరమైనవి: డేటా నిర్మాణాలు

కోర్సు లక్ష్యాలు

డేటా వేర్‌హౌస్‌లను రూపొందించడానికి మరియు ఉపయోగించడానికి, వివిధ డేటా మైనింగ్ టెక్నిక్‌లను అర్థం చేసుకోవడానికి, నేర్చుకోవడానికి మరియు ఈ పద్ధతుల యొక్క అనువర్తనాన్ని అర్థం చేసుకోవడానికి సాంకేతికతలు మరియు వ్యూహాల పరిజ్ఞానం అందించడం ఈ కోర్సు యొక్క లక్ష్యం.

కోర్సు ఫలితాలు

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	వేర్‌హౌసింగ్ మరియు డేటా ప్రిప్రాసెసింగ్ టెక్నిక్‌ల ప్రాథమిక భావనలను అర్థం చేసుకోండి
CO2	డేటాసెట్‌లలో వివిధ ఆసక్తికరమైన నమూనాలు మరియు అనుబంధాలను పొందండి.
CO3	భవిష్యత్ ట్రెండ్‌లను అంచనా వేయడానికి వర్గీకరణ నమూనాలను రూపొందించండి మరియు అభివృద్ధి చేయండి.
CO4	ఇచ్చిన అప్లికేషన్ కోసం పర్యవేక్షించబడని అభ్యాస పద్ధతులను వర్తింపజేయండి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	-	-	-	-	2	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	-	3	2	-	-	-	-	-	-	2	2	2	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	-	2	3

యూనిట్ I: డేటావేర్‌హౌసింగ్ మరియు వ్యాపార విశ్లేషణ

డేటా వేర్‌హౌస్ మరియు ఆన్‌లైన్ విశ్లేషణాత్మక ప్రాసెసింగ్: డేటా వేర్‌హౌస్ ప్రాథమిక భావనలు, డేటా వేర్‌హౌస్ మోడలింగ్: డేటా క్యూబ్ మరియు OLAP, డేటా వేర్‌హౌస్ ఇంప్లిమెంటేషన్, అట్రిబ్యూట్ ఓరియెంటెడ్ ఇండక్షన్ ద్వారా డేటా సాధారణీకరణ. డేటా ప్రిప్రాసెసింగ్: ఓవర్‌వ్యూ, డేట క్లీనింగ్, డేటా ఇంటిగ్రేషన్, డేటా తగ్గింపు, డేటా ట్రాన్స్‌ఫర్మేషన్ మరియు డేటా డిస్క్రిమినేషన్.

యూనిట్ II: డేటా మైనింగ్ అవలోకనం మరియు అధునాతన నమూనా మైనింగ్

డేటా మైనింగ్ పరిచయం: పరిచయం, ఎందుకు డేటా మైనింగ్, తవ్వగల డేటా రకాలు, తవ్వగల నమూనాలు, దానిని ఉపయోగించగల సాంకేతికతలు, డేటా మైనింగ్‌లో ప్రధాన సమస్యలు.

మైనింగ్ తరచుగా చేసే నమూనాలు, సంఘాలు మరియు సహసంబంధాలు: ప్రాథమిక భావనలు, తరచుగా వస్తువు-సెట్ మైనింగ్ పద్ధతులు. (అప్రియోరి మరియు FP గ్రోత్ అల్గోరిథంలు)

యూనిట్ III: వర్గీకరణ మరియు అంచనా

వర్గం

యూనిట్ IV: క్లస్టరింగ్ విశ్లేషణ

క్లస్టర్ విశ్లేషణ: ప్రాథమిక క్లస్టరింగ్ పద్ధతుల పరిచయం, అవలోకనం, విభజన పద్ధతులు, క్రమానుగత పద్ధతులు, సాంద్రత-ఆధారిత పద్ధతులు: DBSCAN& OPTICS, అవుట్‌లియర్ విశ్లేషణకు పరిచయం

యూనిట్ V: వెబ్ మరియు టెక్స్ట్ మైనింగ్

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కాంప్లెక్స్ డేటా ఆబ్జెక్ట్‌ల మల్టీడైమెన్షనల్ విశ్లేషణ మరియు డిస్క్రిమినేటివ్ మైనింగ్-పరిచయం, వెబ్ మైనింగ్, వెబ్ కంటెంట్ మైనింగ్, వెబ్ స్ట్రక్చర్ మైనింగ్, వి యూసేజ్ మైనింగ్, సెక్స్ మైనింగ్, అన్‌స్ట్రక్చర్డ్ సెక్స్, సెక్స్‌ల కోసం ఎపిసోడ్ రూల్ డిస్కవరీ, వర్గాల సోపానక్రమం, సెక్స్ క్లస్టరింగ్.
సెక్స్ బుక్స్
[1] _ Jiawe i H a n a nd M ic h e line K a mbe r , -D a t a M ining Conce pts a nd T ec hniques I , థర్డ్ ఎడిట్ i on, Elsevier, 2012 .
రిఫరెన్స్ పుస్తకాలు:
[1].GKGupta,—Introductionto DataMiningwithCaseStudies!,EsterEconomyEdition, Prenice Hall of India, 2006 [2].AP ఆంగ్-నింగ్ టాన్, మైకేల్ స్టెయిన్‌బాచ్ మరియు విపిన్ కుమార్, -ఇంట్రడక్షన్ టు డేటా మైనింగ్I , సెకండ్ ఎడిషన్ పియర్సన్ ఎడ్యుకేషన్, 2016 [3].KP సోమన్, శ్యామ్ దివాకర్ మరియు V. అజయ్ -ఇన్‌సైట్ ఇన్ డేటా మైనింగ్ థియరీ అండ్ ప్రాక్టీస్I , ఈస్టర్ ఎకానమీ ఎడిషన్, ప్రెంటిస్ హాల్ ఆఫ్ ఇండియా, 2006
ఇ -రిసోర్సెస్
బిగినర్స్ కోసం డేటా వేర్‌హౌస్ ట్యుటోరియల్ | డేటా వేర్‌హౌస్ కాన్సెప్ట్‌లు | డేటా వేర్‌హౌసింగ్ | ఎదురుకా (2017) https://www.youtube.com/watch?v=J326LIUrZM8&t=4s ఆర్టిఫిషియల్ న్యూరల్ నెట్‌వర్క్ (Ann) అల్గోరిథం ఎలా పని చేస్తుంది | డేటా మైనింగ్ | న్యూరల్ నెట్‌వర్క్ పరిచయం(2016)https://www.youtube.com/watch?v=fwnaijgpih ,

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Course Title: Data Warehousing and Data Mining

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

Prerequisites: Data Structures

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	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	-	-	-	-	2	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	-	3	2	-	-	-	-	-	-	2	2	2	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	-	2	3

UNIT I: DATAWAREHOUSING AND BUSINESSANALYSIS

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 OVERVIEW AND ADVANCEDPATTERN MINING

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 AND PREDICTION

Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines

UNIT IV: CLUSTERING ANALYSIS

Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN& OPTICS, introduction to outlier analysis

UNIT V: WEB AND TEXT MINING

Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Introduction, web mining, web content

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mining, web structure mining, we usage mining, Text mining, unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

Text Books

[1].Jiawei Han and Micheline Kamber, -Data Mining Concepts and Techniquesl, Third Edition, Elsevier, 2012.

REFERENCE BOOKS:

[1].G.K.Gupta,—IntroductiontoDataMiningwithCaseStudiesl,EasterEconomyEdition,Prentice Hall of India, 2006

[2].APang-Ning Tan, Michael Steinbach and Vipin Kumar, -Introduction to DataMiningl, Second Edition Pearson Education, 2016

[3].K.P. Soman, ShyamDiwakar and V. Ajay -Insight into Data mining Theory and Practicel, Easter Economy Edition, Prentice Hall of India, 2006

E-RESOURCES

Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017)https://www.youtube.com/watch?v=J326LlUrZM8&t=4s

How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network(2016)https://www.youtube.com/watch?v=fwnaijgpih,

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కోర్సు శీర్షిక: అధునాతన డేటా నిర్మాణాలు

ఉపన్యాసం - ప్రాక్టికల్:	3-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్	3	బాహ్య గుర్తులు:	70

అవసరమైనవి: డేటా నిర్మాణాలు

కోర్సు లక్ష్యాలు

- వివరించండి మరియు అమలు a వివిధ యొక్క ఆధునిక సమాచారం నిర్మాణాలు (హాష్ పట్టికలు, ప్రాధాన్యత క్యూలు, సమతుల్యవెతకండి TREES, డిజిటల్ శోధన TREES).
- విశ్లేషించడానికి స్థలం మరియు సమయం సంక్లిష్టత యొక్క ది అల్గోరిథంలు లో చదువుకున్నారు కోర్సు.
- గుర్తించండి భిన్నమైనది పరిష్కారాలు కోసం a ఇచ్చిన సమస్య; విశ్లేషించడానికి ప్రయోజనాలు మరియు ప్రతికూలతలు కు భిన్నమైనదిపరిష్కారాలు.

కోర్సు ఫలితాలు

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	హాషింగ్ యొక్క ప్రాముఖ్యత, కార్యకలాపాలు మరియు అనువర్తనాన్ని అర్థం చేసుకోగలరు
CO2	స్కిప్ జాబితాల అమలును అర్థం చేసుకోగలరు
CO3	విభిన్న సమతుల్య చెట్ల గురించి మంచి అవగాహన పొందగలుగుతారు.
CO4	HEAP మరియు ద్విపద క్యూల అమలును అర్థం చేసుకోగలరు.
CO5	స్ట్రింగ్ మ్యాచింగ్ వంటి వివిధ ప్రాంతాలలో అల్గారిథమ్‌ల అప్లికేషన్‌లపై ఒక ఆలోచన కలిగి ఉండండి, ఇండెక్సింగ్ మొదలైనవి.
CO6	TRIE'S యొక్క ప్రాముఖ్యత మరియు అనువర్తనాలను అర్థం చేసుకోగలరు

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3

యూనిట్ I:నిఘంటువులు: సెట్‌లు, నిఘంటువులు, స్టాటిక్ హ్యాషింగ్- హాష్ టేబుల్, హాష్ ఫంక్షన్‌లు- సురక్షిత హాష్ ఫంక్షన్, ఓవర్‌ఫ్లో హ్యాండ్లింగ్, థియరిటికల్ ఓవర్‌ఫ్లో టెక్నిక్స్ యొక్క మూల్యాంకనం

యూనిట్ II: డైనమిక్ హాషింగ్ మరియు స్కిప్ జాబితాలు

డైనమిక్ హాషింగ్- డైనమిక్ హ్యాషింగ్, డైనమిక్ కోసం ప్రేరణ హాషింగ్ ఉపయోగించి డైరెక్టరీలు, డైరెక్టరీ తక్కువ డైనమిక్ హ్యాషింగ్, హాష్ పట్టిక పునర్నిర్మాణం, దాటవేయి జాబితాలు, విశ్లేషణ యొక్క జాబితాలను దాటవేయి.

UNIT III: సమతుల్యం TREES

AVL TREES: గరిష్టం ఎత్తు యొక్క ఒక AVL TREE, చొప్పించడం మరియు తొలగింపులు. 2-3 TREES : చొప్పించడం,తొలగింపు, అప్లికేషన్లు, ఎరుపు-నలుపు చెట్లకు పరిచయం

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UNIT IV: ప్రాధాన్యత క్యూలు

బైనరీ హీప్స్ : ఇన్సర్ట్ అండ్ డిలీట్ నిమి, హీప్ క్రియేట్ చేయడం.
ద్విపద క్యూలు : ద్విపద క్యూ ఆపరేషన్లు, ద్విపద విమోచన విశ్లేషణ, లేజీ ద్విపద క్యూలు

UNIT V: నమూనా సరిపోలే మరియు ప్రయత్నిస్తుంది

ప్యాటర్న్ మ్యాచింగ్ అల్గోరిథంలు- బోయర్-మూర్ అల్గోరిథం, నూత్-మోరిస్-ప్రాట్ అల్గోరిథం
ప్రయత్నాలు: డిజిటల్ శోధన TREE యొక్క నిర్వచనాలు మరియు భావనలు, బైనరీ ట్రై, ప్యాట్రిసియా , మల్టీ-వే ట్రై

టెక్స్ట్ బుక్

1. ఫండమెంటల్స్ యొక్క సమాచారం నిర్మాణాలు లో సి: 2 ned, , హొరోవిట్జ్ , సహని, అండర్సన్-విముక్తి,విశ్వవిద్యాలయాలు నొక్కండి.
2. సమాచారం నిర్మాణాలు మరియు అల్గోరిథం విశ్లేషణ లో సి, 2 nd సంచిక, మార్క్ అలెన్ వీస్, పియర్సన్

రిఫరెన్స్ పుస్తకాలు:

1. సమాచారం నిర్మాణాలు, ఎ సూడోకోడ్ విధానం, రిచర్డ్ ఎఫ్ గిల్బర్గ్, బెహ్రూజ్ ఎ ఫోరౌజన్, సెంగేజ్.
2. పరిచయం కు అల్గోరిథంలు, 3వ ఎడిషన్ ద్వారా థామస్ హెచ్ కోర్మెన్ , చార్లెస్ ఇ. లీజర్సన్, రోనాల్డ్ ఎల్. రివెస్ట్, క్లిఫోర్డ్ స్టెయిన్

ఇ -రిసోర్సెస్

1. వెబ్ : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3. http://fr ee videolectures.com/Course/2519/C-Programming-and-Data-Structures
4. http://fr ee videolectures.com/Course/2279/Data-Structures-And-Algorithms

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Course Title: Advanced Data Structures

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

Prerequisites: Data Structures

Course Objectives

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balancedsearch 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 differentsolutions.

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3

Dictionaries: Sets,Dictionaries,Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques

UNIT II: Dynamic Hashing and Skip Lists

Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Hash Table Restructuring, Skip Lists,Analysis of Skip Lists.

UNIT III: 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 IV: Priority Queues

Binary Heaps : Implementation of Insert and Delete min, Creating Heap.
Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy BinomialQueues

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NRI Institute of Technology
Agiripalli-521 212, Andhra Pradesh.

UNIT V: 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 Book

3. Fundamentals of DATA STRUCTURES in C: 2 nded, , Horowitz , Sahani, Anderson-freed,Universities Press.
4. Data structures and Algorithm Analysis in C, 2 nd edition, Mark Allen Weiss, Pearson

REFERENCE BOOKS:

3. Data Structures, a Pseudocode Approach, Richard F Gilberg, Behrouz A Forouzan,Cengage.
4. Introduction to Algorithms, 3rd Edition by *Thomas H.* Cormen , *Charles E. Leiserson, Ronald L.Rivest, Clifford Stein*

E-RESOURCES

5. Web : http://lcm.csa.iisc.ernet.in/dsa/dsa.html
6. http://utubersity.com/?page_id=878
7. http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
8. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms

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కోర్సు శీర్షిక: కంప్యూటర్ నెట్‌వర్క్స్ ల్యాబ్

ఉపన్యాసం – ట్యుటోరియల్- ప్రాక్టికల్::	0-0-3	**అంతర్గత మార్కులు:**	15
క్రెడిట్స్:	1.5	**బాహ్య గుర్తులు:**	35

ముందస్తు అవసరాలు: సి ప్రోగ్రామింగ్, UNIX యొక్క ప్రాథమిక ఆదేశాలు.
సి ప్రోగ్రామింగ్ పరిజ్ఞానం, UNIX యొక్క ప్రాథమిక ఆదేశాలు

కోర్సు లక్ష్యాలు:

C ప్రోగ్రామింగ్ మరియు జావా

కోర్సు ఫలితాలు:

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	బిట్ స్టఫింగ్ మరియు బైట్ స్టఫింగ్ వంటి డేటా లింక్ లేయర్ ఫ్రామింగ్ పద్ధతులను లెక్కించగలగాలి.
CO2	విభిన్న బహుపదాలపై చక్రీయ పునరావృత తనిఖీని విశ్లేషించగలగాలి.
CO3	TCP మరియు UDP ప్రోటోకాల్‌లను ఉపయోగించడం ద్వారా సాకెట్ ప్రోగ్రామింగ్ ఇంప్లిమెంటేషన్‌ను అర్థం చేసుకోగలగాలి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం (1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	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

ప్రోగ్రామ్‌ల జాబితా

1. ifconfig, netstat, ping, arp, telnet, ftp, finger, traceroute, whois మొదలైన కమాండ్‌లను అర్థం చేసుకోవడం మరియు ఉపయోగించడం. ప్రాథమిక సాకెట్ సిస్టమ్ కాల్‌ల వినియోగం (socket (), bind(), listen(), అంగీకరించు(),కనెక్ట్(),పంపు(),recv(),sendto(),recvfrom()).
2. కనెక్షన్ ఓరియెంటెడ్ కాకరెంట్ సర్వీస్ (TCP) అమలు.
3. కనెక్షన్‌లెస్ ఇటరేటివ్ టైమ్ సర్వీస్ (UDP) అమలు.
4. సెలెక్ట్(),గెట్‌పీర్‌నేమ్ () సిస్టమ్ కాల్‌ని అమలు చేయడం.
5. gesockopt (), setsockopt () సిస్టమ్ కాల్‌ల అమలు.
6. సాకెట్ సిస్టమ్ కాల్‌లను ఉపయోగించి రిమోట్ కమాండ్ ఎగ్జిక్యూషన్ అమలు.
7. క్యారెక్టర్ స్టఫింగ్ మరియు బిట్ స్టఫింగ్ వంటి డేటా లింక్ లేయర్ ఫ్రేమింగ్ పద్ధతులను అమలు చేయండి.
8. మూడు CRC బహుపదాలు - CRC 12, CRC 16 మరియు CRC CCIP అక్షరాల డేటా సెట్‌పై అమలు చేయండి.
9. గ్రాఫ్ ద్వారా చిన్నదైన మార్గాన్ని గణించడానికి Dijkstra యొక్క అల్గారిథమ్‌ను అమలు చేయండి.
10. డిస్టెన్స్ వెక్టర్ రూటింగ్ అల్గోరిథం అమలు.
11. SMTP అమలు.
12. FTP అమలు.

గమనిక: Cలో 2 నుండి 6 వరకు మరియు JAVAలో 8 నుండి 12 వరకు ప్రోగ్రామ్‌లను అమలు చేయండి.

టెక్స్ట్ పుస్తకాలు:

1.టానెన్‌బామ్ మరియు డేవిడ్ J వెథెరాల్, కంప్యూటర్ నెట్‌వర్క్స్, 5 వ ఎడిషన్, పియర్సన్ ఎడు, 2010.
2.కంప్యూటర్ నెట్‌వర్క్‌లు: ఎ టాప్ డౌన్ అప్రోచ్, బెహ్రూజ్ ఎ. ఫోరౌజన్ , ఫిరౌజ్ మోషారఫ్, మెక్‌గ్రా హిల్ ఎడ్యుకేషన్.

e-వనరులు:

- http://www.softpanorama.org/Internals/unix_system_calls.shtml

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- https://www.tutorialspoint.com/system-calls-in-unix-and-windows

Course Title: Computer Networks Lab

Lecture – Practical::	**Tutorial-** 0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

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 (like netstat, 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

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కోర్సు శీర్షిక: ఆర్టిఫిషియల్ ఇంటెలిజెన్స్ ల్యాబ్

ఉపన్యాసం–ట్యుటోరియల్-ప్రాక్టికల్::	0-0-3	అంతర్గత మార్కులు:	15
క్రెడిట్స్:	1.5	బాహ్య గుర్తులు:	35

ముందస్తు అవసరాలు: కృత్రిమ మేధస్సు భావనలు

కోర్సు లక్ష్యాలు

- AI ఆధారిత అల్గారిథమ్‌ల రూపకల్పన మరియు విశ్లేషణ కోసం నైపుణ్యాలను అందించడం.
- విద్యార్థులు వివిధ AI సాధనాలపై పని చేయడానికి వీలు కల్పించడం.
- నిజ జీవిత సమస్యల పరిష్కారానికి పని చేసే నైపుణ్యాలను అందించడం.

కోర్సు ఫలితాలు:
కోర్సు పూర్తయిన తర్వాత, విద్యార్థులు చేయగలుగుతారు

CO1: సాఫ్ట్‌వేర్ అవసరాలను గుర్తించండి, విశ్లేషించండి మరియు పేర్కొనండి.
CO2: ఇచ్చిన సమస్య దృష్టాంతాన్ని అనుకరించండి మరియు దాని పనితీరును విశ్లేషించండి.
CO3: ఇచ్చిన సమస్య దృష్టాంతం కోసం ప్రోగ్రామింగ్ పరిష్కారాలను అభివృద్ధి చేయండి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-

ప్రయోగాల జాబితా

C/C++/LISP/PROLOG వంటి ఏదైనా భాషను ఉపయోగించండి

1. "వాటర్ జగ్ సమస్య" పరిష్కరించండి.
2. 8 క్వీన్స్ సమస్యను పరిష్కరించడానికి ఒక ప్రోగ్రామ్‌ను వ్రాయండి
3. డెప్త్ ఫస్ట్ సెర్చ్‌ని ఉపయోగించి ఏదైనా సమస్యను పరిష్కరించండి.
4. ఉత్తమ మొదటి శోధనను ఉపయోగించి ఏదైనా సమస్యను పరిష్కరించండి.
5. ఉత్తమ మొదటి శోధనను ఉపయోగించి 8-పజిల్ సమస్యను పరిష్కరించండి
6. A* అల్గోరిథం కోసం అవుట్‌పుట్‌ను రూపొందించడానికి ప్రోగ్రామ్‌ను వ్రాయండి
7. హనోయి టవర్‌ని అమలు చేయడానికి ఒక ప్రోగ్రామ్‌ను వ్రాయండి
8. ప్రిడికేట్‌లను వ్రాయండి ఒకటి సెంటీగ్రేడ్ ఉష్ణోగ్రతలను ఫారెన్‌హీట్‌గా మారుస్తుంది, మరొకటి ఉష్ణోగ్రత గడ్డకట్టే స్థాయి కంటే తక్కువగా ఉంటే తనిఖీ చేస్తుంది.
9. మంక బనానా సమస్యను పరిష్కరించడానికి ప్రోగ్రామ్ రాయండి
10. హిల్ క్లైంబింగ్‌ను పరిష్కరించడానికి ఒక ప్రోగ్రామ్‌ను వ్రాయండి.
11. AIలో శోధన పద్ధతుల అమలు.
12. వివిధ AI సాధనాలపై ఇన్‌స్టాలేషన్ మరియు పని చేయడం. పైథాన్, R టూల్, గేట్, NLTK, MATLAB, మొదలైనవి.
13. డేటా ప్రిప్రాసెసింగ్ మరియు ఉల్లేఖనం మరియు డేటాసెట్‌ల సృష్టి.
14. ఇప్పటికే ఉన్న డేటాసెట్‌లు మరియు ట్రీబ్యాంక్‌లను తెలుసుకోండి
15. నాలెడ్జ్ ప్రాతినిధ్య పథకాల అమలు.

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16. వర్గీకరణ మరియు క్లస్టరింగ్ సమస్య యొక్క అప్లికేషన్.
17. సహజ భాషా ప్రాసెసింగ్ సాధనం అభివృద్ధి.

గమనిక: సంబంధిత కోర్స్ కోఆర్డినేటర్ పైన పేర్కొన్న సాధారణ జాబితా ఆధారంగా సెమిస్టర్ ప్రారంభంలో ప్రయోగాలు/సమస్యల వాస్తవ జాబితాను ఖరారు చేస్తారు.

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Course Title: Artificial Intelligence Lab

Lecture–Tutorial-Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Artificial Intelligence concepts

Course Objectives

- To provide skills for designing and analyzing AI based algorithms.
- To enable students to work on various AI tools.
- To provide skills to work towards solution of real life problems.

CourseOutcomes:
UponCompletionofthecourse,thestudentswillbeableto

CO1: Elicit, analyze and specify software requirements.
CO2: Simulate given problem scenario and analyze its performance.
CO3: Develop programming solutions for given problem scenario.

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	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-

List of Experiments

Use any language such as C/C++/LISP/PROLOG

1. Solve "Water Jug Problem".
2. Write a program to solve 8 queens' problem
3. Solve any problem using depth first search.
4. Solve any problem using best first search.
5. Solve 8-puzzle problem using best first search
6. Write A Program to Generate the output for A* Algorithm
7. Write a program to implement tower of Hanoi
8. Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
9. Write a program to solve the Monkey Banana problem
10. Write a program to solve Hill climbing.
11. Implementation of searching techniques in AI.
12. Installation and working on various AI tools viz. Python, R tool, GATE, NLTK, MATLAB, etc.
13. Data preprocessing and annotation and creation of datasets.
14. Learn existing datasets and Treebanks
15. Implementation of Knowledge representation schemes.
16. Application of Classification and clustering problem.
17. Natural language processing tool development.

Note: The concerned Course Coordinator will finalize the actual list of experiments/problems at the start of semester based on above generic list.

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కోర్సు శీర్షిక: DEVOPS LAB

ఉపన్యాసం - ప్రాక్టికల్:	0-0-4	అంతర్గత మార్కులు:	15
క్రెడిట్స్	2	బాహ్య గుర్తులు:	35

ముందస్తు అవసరాలు:
ఒకటి లేదా అంతకంటే ఎక్కువ ఉన్నత-స్థాయి ప్రోగ్రామింగ్ భాషల (C#, Java, PHP, Ruby, Python, మొదలైనవి) వర్కింగ్ పరిజ్ఞానం Linux లేదా Windows సిస్టమ్‌లను కమాండ్-లైన్ స్థాయిలో నిర్వహించడంలో ఇంటర్మీడియట్ పరిజ్ఞానం

కోర్సు లక్ష్యాలు : ఈ కోర్సు యొక్క లక్ష్యం అభివృద్ధి మరియు దాని కార్యకలాపాలకు బలమైన పునాదిని అందించడం.

కోర్సు ఫలితాలు

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు: సాంప్రదాయ సాఫ్ట్‌వేర్ అభివృద్ధిని అర్థం చేసుకోవచ్చు. చురుకైన మెథడాలజీల పెరుగుదలను తెలుసుకోండి. •DevOps యొక్క ఉద్దేశ్యాన్ని నిర్వచించండి మరియు రూపకల్పన చేయండి.•

CO1	సాఫ్ట్‌వేర్ సిస్టమ్ కోసం అవసరాలను నిర్ణయించడంలో చురుకైన సాఫ్ట్‌వేర్ అభివృద్ధి పద్ధతుల యొక్క ప్రాముఖ్యతను గ్రహించండి
CO2	సాఫ్ట్‌వేర్ అభివృద్ధి కార్యకలాపాలను నిర్వహించడానికి పునరుక్తి సాఫ్ట్‌వేర్ అభివృద్ధి ప్రక్రియలను విశ్లేషించండి మరియు అమలు చేయండి.
CO3	ఒక నిర్దిష్ట పరిస్థితి లేదా అవసరం కోసం చురుకైన సూత్రాలు మరియు నిర్వచించిన అభ్యాసాల గురించి క్రమబద్ధమైన అవగాహనను వర్తింపజేయండి.
CO4	బృందం సహకారం మరియు సాఫ్ట్‌వేర్ నాణ్యతను మెరుగుపరచడం ద్వారా సాఫ్ట్‌వేర్ అభివృద్ధిని విజయవంతంగా పూర్తి చేయడంలో DevOps ప్రభావాన్ని పరిశీలించండి.
CO5	ఎంటర్‌ప్రైజ్ స్థాయిలో DevOps సామర్థ్యాలను వర్తింపజేయడం ద్వారా సాఫ్ట్‌వేర్ ప్రక్రియను మెరుగుపరచండి.

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	2	-	-		3	2	3	3
CO2	2	3	2	3	-	-	-	-	-	-	2	3	3	3	3
CO3	2	2	3	3	2	-	2	-	2	-	2	-	2	-	3
CO4	2	-	2	2	2	-	2	-	-	-	-	3	2	3	-
CO5	-	-	2	2	2	-	3	-	2	-	2	3	3	3	3

ప్రోగ్రామ్‌ల జాబితా

1) DevOps మెథడాలజీ యొక్క లోతైన జ్ఞానం
2) సాఫ్ట్‌వేర్ వెర్షన్ నియంత్రణను అమలు చేస్తోంది
3) డాక్‌ని ఉపయోగించి ఉత్పత్తిపై కంటెయినరైజింగ్ కోడ్
4) జెంకిన్స్‌ని ఉపయోగించి CI/CD పైప్‌లైన్‌లను సృష్టిస్తోంది
5) పప్పెట్ మరియు అన్సిబుల్ ఉపయోగించి కాన్ఫిగరేషన్ మేనేజ్‌మెంట్
6) సెలీనియం మరియు మావెన్‌ని ఉపయోగించి ఆటోమేట్ బిల్డ్ మరియు టెస్ట్
7) Kubernetes ఉపయోగించి కంటైనర్ ఆర్కెస్ట్రేషన్

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8) Nagios ఉపయోగించి పనితీరు ట్యూనింగ్ మరియు మానిటరింగ్

9) డెవొప్స్ టూల్స్: జెంకిన్స్, డాకర్. ఫాంటమ్.,నాగియోస్ వాగ్రాంట్,అన్సిబుల్,గిట్‌హబ్.

e -రిసోర్సెస్

https://www.guru99.com/

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URL: www.nriit.edu.in. email: principal@nriit.edu.in. Mobile: + 91 8333882444

Course Title: DEVOPS LAB

Lecture – Practical:	0-0-4	**Internal Marks:**	15
Credits	2	**External Marks:**	35

Prerequisites:
Working knowledge of one or more high-level programming languages (C#, Java, PHP, Ruby, Python, etc.) Intermediate knowledge of administering Linux or Windows systems at the command-line level

Course Objectives : The Objective of this course is to give a strong foundation of the Development and its Operations.

Course Outcomes

Upon successful completion of the course, the student will be able to: Understand the traditional software development. Learn the rise of agile methodologies.• Define and design purpose of DevOps.•

CO1	Realize the importance of agile software development practices in determining the requirements for a software system
CO2	Analyze and execute iterative software development processes to manage software development activities.
CO3	Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need.
CO4	Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality.
CO5	Perform software process improvement by applying DevOps capabilities at enterprise level.

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	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	2	-	-		3	2	3	3
CO2	2	3	2	3	-	-	-	-	-	-	2	3	3	3	3
CO3	2	2	3	3	2	-	2	-	2	-	2	-	2	-	3
CO4	2	-	2	2	2	-	2	-	-	-	-	3	2	3	-
CO5	-	-	2	2	2	-	3	-	2	-	2	3	3	3	3

PROGRAMS LIST

10) **In-depth knowledge of DevOps methodology**

11) **Implementing Software Version Control**

12) **Containerizing Code on production using Docke**

13) **Creating CI/CD Pipelines using Jenkins**

14) **Configuration Management using Puppet and Ansible**

15) **Automating build and test using Selenium and Maven**

16) **Container Orchestration using Kubernetes**

17) **Performance Tuning and Monitoring using Nagios**

18) **Devops Tools : Jenkins,Docker. Phantom.,NagiosVagrant,Ansible,GitHub.**

E-RESOURCES: https://www.guru99.com/

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కోర్సు కోడ్-ఎంప్లాయబిలిటీ స్కిల్స్-I

ఉపన్యాసం - ప్రాక్టికల్:	2-0-0	అంతర్గత మార్కులు:	30
క్రెడిట్స్	0	బాహ్య గుర్తులు:	70*

ముందస్తు అవసరాలు: ఏదీ లేదు

కోర్సు లక్ష్యాలు:
1. ప్రాథమిక కమ్యూనికేషన్ నైపుణ్యాలను అన్వేషించడానికి మరియు సాధన చేయడానికి
2.సమర్థవంతమైన చర్చలు & టీమ్ వర్క్ కోసం నైపుణ్యాలను నేర్చుకోవడం
3.వ్యక్తిగత వ్రస్తధారణను అంచనా వేయడానికి మరియు మెరుగుపరచడానికి

కోర్సు ఫలితాలు

కోర్సు విజయవంతంగా పూర్తి చేసిన తర్వాత, విద్యార్థి వీటిని చేయగలరు:

CO1	యజమానులు, పర్యవేక్షకులు మరియు సహోద్యోగులతో సమర్థవంతమైన కమ్యూనికేషన్‌ను ఏర్పాటు చేయండి
CO2	వ్యక్తిగత నైపుణ్య మదింపుల ద్వారా వారి విలువలు మరియు కెరీర్ ఎంపికలను అన్వేషించడానికి గుర్తించండి
CO3	సానుకూల దృక్పథాన్ని మరియు తగిన బాడీ లాంగ్వేజ్‌ని అలవర్చుకుంటుంది
CO4	వృత్తిపరమైన మరియు వ్యక్తిగత జీవితంలో విజయం సాధించడానికి ప్రధాన సామర్థ్యాలను వివరించండి

ప్రోగ్రామ్ ఫలితాల సాధనకు కోర్సు ఫలితాల సహకారం
(1 - తక్కువ, 2- మధ్యస్థం, 3 - అధికం)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1								2		2					
CO2								2							
CO3										2					2
CO4								2		2		2			

యూనిట్ I: సాఫ్ట్ స్కిల్స్:
ఒక పరిచయం - సాఫ్ట్ స్కిల్స్ యొక్క నిర్వచనం మరియు ప్రాముఖ్యత; సాఫ్ట్ స్కిల్ డెవలప్‌మెంట్ ప్రక్రియ, ప్రాముఖ్యత మరియు కొలత. స్వీయ-ఆవిష్కరణ: స్వీయ-ఆవిష్కరణ; లక్ష్య నిర్ధారణ; నమ్మకాలు, విలువలు, వైఖరి, ధర్మం.

యూనిట్ 2: సానుకూలత మరియు ప్రేరణ:
సానుకూల ఆలోచన మరియు వైఖరిని అభివృద్ధి చేయడం; ప్రతికూలతను తరిమికొట్టడం; మోటివేషన్ అర్థం మరియు థియరీస్; ప్రేరణ స్థాయిలను మెరుగుపరచడం

UNIT III: ఇంటర్ పర్సనల్ కమ్యూనికేషన్:
వ్యక్తుల మధ్య సంబంధాలు; కమ్యూనికేషన్ నమూనాలు, ప్రక్రియ మరియు అడ్డంకులు; జట్టు కమ్యూనికేషన్; సమర్థవంతమైన కమ్యూనికేషన్ ద్వారా వ్యక్తుల మధ్య సంబంధాలను అభివృద్ధి చేయడం; వినికిడి నైపుణ్యత; అవసరమైన అధికారిక వ్రాత నైపుణ్యాలు; కార్పొరేట్ కమ్యూనికేషన్ శైలులు, దృఢత్వం, ఒప్పించడం, చర్చలు.

UNIT IV: పబ్లిక్ స్పీకింగ్:

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సమర్థవంతమైన పబ్లిక్ స్పీకింగ్ కోసం నైపుణ్యాలు, పద్ధతులు, వ్యూహాలు మరియు అవసరమైన చిట్కాలు. సమూహ చర్చ: ప్రాముఖ్యత, ప్రణాళిక, అంశాలు, నైపుణ్యాలు అంచనా వేయబడ్డాయి; ప్రభావవంతంగా విభేదించడం, ప్రారంభించడం, సంగ్రహించడం మరియు లక్ష్యాన్ని సాధించడం.
యూనిట్ V: నాన్-వెర్బల్ కమ్యూనికేషన్ ప్రాముఖ్యత మరియు అంశాలు; శరీర భాష. టీమ్‌వర్క్ మరియు లీడర్‌షిప్ స్కిల్స్: టీమ్‌ల కాన్సెప్ట్; సమర్థవంతమైన బృందాలను నిర్మించడం; నాయకత్వం యొక్క భావన మరియు నాయకత్వ నైపుణ్యాలను మెరుగుపరుస్తుంది.
రిఫరెన్స్ పుస్తకాలు: 1) బరున్ కె. మిత్ర, పర్సనాలిటీ డెవలప్‌మెంట్ అండ్ సాఫ్ట్ స్కిల్స్, ఆక్స్‌ఫర్డ్ యూనివర్సిటీ ప్రెస్, 2011. 2) SP ధనవేల్, ఇంగ్లీష్ మరియు సాఫ్ట్ స్కిల్స్, ఓరియంట్ బ్లాక్‌స్వాన్, 2010. 3) RSAggarwal, వెర్బల్ & నాన్-వెర్బల్ రీజనింగ్, S.Chand & Company Ltd., 2018కి ఆధునిక విధానం. 4) రామన్, మీనాక్షి & శర్మ, సంగీత, టెక్నికల్ కమ్యూనికేషన్ ప్రిన్సిపల్స్ అండ్ ప్రాక్టీస్, ఆక్స్‌ఫర్డ్ యూనివర్సిటీ ప్రెస్, 2011. 5) RSAggarwal, వెర్బల్ & నాన్-వెర్బల్ రీజనింగ్‌కు ఆధునిక విధానం, S.Chand & Company Ltd., 2018. 6) రామన్, మీనాక్షి & శర్మ, సంగీత, టెక్నికల్ కమ్యూనికేషన్ ప్రిన్సిపల్స్ అండ్ ప్రాక్టీస్, ఆక్స్‌ఫర్డ్ యూనివర్సిటీ ప్రెస్, 2011.
e-రిసోర్సెస్

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Course Title-Employability Skills-I

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

Prerequisites: None

Course Objectives:
1.To explore and practice basic communication skills
2.To learn skills for effective discussions & team work
3.To assess and improve personal grooming

Course Outcomes

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

CO1	Establish effective communication with employers, supervisors, and co-workers
CO2	Identify to explore their values and career choices through individual skill assessments
CO3	Adapts positive attitude and appropriate body language
CO4	Interpret the core competencies to succeed in professional and personal life

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	PO12	PSO1	PSO2	PSO3
CO1								2		2					
CO2								2							
CO3										2					2
CO4								2		2		2			

UNIT I: Soft Skills:
An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.

Unit 2: Positivity and Motivation:
Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels

UNIT III: Interpersonal Communication:
Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles, assertion, persuasion, negotiation.

UNIT IV: Public Speaking:
Skills, Methods, Strategies and Essential tips for effective public speaking.Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.

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UNIT V: Non-Verbal Communication

Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

REFERENCE BOOKS:

1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-RESOURCES

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PRPOPSED 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/D	Total	CIA	SEA	Total	
1	20A3105402	Artificial Intelligence	3	0	0	3	30	70	100	3
2	20A3105401	Computer Networks	3	0	0	3	30	70	100	3
3	20A3105403	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	20A310560	OE-1	3	0	0	3	30	70	100	3
5	20A310551	PE-1	3	0	0	3	30	70	100	3
6	20A3105491	Computer Networks lab	0	0	3	3	15	35	50	1.5
7	20A3105492	AI Programming Lab	0	0	3	3	15	35	50	1.5
8	20A3105991	DEVOPS	0	0	4	4	15	35	50	2
10	20A3105801	Employability Skills-1	2	0	0	2	30	70*	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			17	0	10	27	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective - 1
20A3105511	1.1 Cloud computing
20A3105512	1.2 Software Testing Methodologies and Tools
20A3105513	1.3 Data Warehousing and Data Mining
20A3105514	1.4 Advanced Data Structures

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DEPARTMENT OF INFORMATION TECHNOLOGY
PRPOPSED 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/D	Total	CIA	SEA	Total	
1	Professional Core courses	Artificial Intelligence	3	0	0	3	30	70	100	3
2	Professional Core courses	Computer Networks	3	0	0	3	30	70	100	3
3	Professional Core courses	Design and Analysis of Algorithms	3	0	0	3	30	70	100	3
4	Open Elective Course/Job oriented elective	OE-1	2	0	2	4	,30	70	100	3
5	Professional Elective courses	PE-1	3	0	0	3	30	70	100	3
6	Professional Core courses Lab	Computer Networks lab	0	0	3	3	15	35	50	1.5
7	Professional Core courses Lab	AI Programming Lab	0	0	3	3	15	35	50	1.5
8	Skill advanced course*	DEVOPS	0	0	4	4	15	35	50	2
10	Mandatory course (AICTE suggested)	Employability Skills-1	2	0	0	2	30	70	100	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)			0	0	0	0	30	70	100	1.5
Total			16	0	12	28	255	595	850	21.5
Honors/Minor courses - 2			**3**	**0**	**2**	**5**	30	70	100	**4**

Code	Professional Elective – 1
	1.1 Cloud computing
	1.2 Software Testing Methodologies and Tools
	1.3 Data Warehousing and Data Mining
	1.4 Advanced Data Structures

Course Title: Artificial Intelligence

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

Prerequisites: None

Course Objectives

- To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- To learn different knowledge representation techniques
- To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing

Course Outcomes:

Upon 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

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	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	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, HeuristicSearchTechniques,Iterative-DeepeningA*,ConstraintSatisfaction

UNIT II:

LogicConceptsandLogicProgramming:Introduction,PropositionalCalculus,Propositional Logic,NaturalDeduction System, Resolution Refutation in Propositional Logic, Predicate Logic,Logic Programming. RepresentingKnowledgeUsingRules:Logicprogramming,ProceduralVsDeclarativeknowledge,Forward Vs Backward Reasoning, Matching,Control Knowledge

UNIT III:

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge RepresentationusingSemanticNetwork,ExtendedSemanticNetworksforKR, Knowledge Representation usingFrames,Conceptualdependencies,Scripts

UNIT IV:

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and AugmentedTransitionNets,SemanticAnalysis,NLPUnderstandingSystems;
Fuzzy Logic: CrispSets,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences & Fuzzy Systems Planning with state-spacesearch–partial-orderplanning–planninggraphs–planningandactingintherealworld

UNIT V:

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of ExpertSystems, Architectures, Knowledge Acquisition and Validation Techniques, Knowledge System Building Tools,ExpertSystemShells.AIProgramminglanguages:Overviewof LISPandPROLOG, ProductionSysteminProlog

Text Book:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw-Hill Publications
2. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

REFERENCE BOOKS:

1. ArtificialIntelligence,GeorgeFLuger,PearsonEducationPublications
2. ArtificialIntelligence: AmodernApproach,RussellandNorvig,PrenticeHall
3. ArtificialIntelligence,RobertSchalkoff,Mcgraw-HillPublications
4. ArtificialIntelligenceandMachineLearning,VinodChandraS.S.,AnandHareendranS.

E-RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. https://nptel.ac.in/courses/106105077
3. https://nptel.ac.in/courses/106102220
4. https://onlinecourses.nptel.ac.in/noc19_me71/preview
5. https://nptel.ac.in/courses/106106126

Course Title: Computer Networks

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

Prerequisites: Computer Networks

Course Objectives:

- Understand state-of-the-art in network protocols, architectures, and applications.
- Process of networking research
- Constraints and thought processes for networking research
- Problem Formulation—Approach---Analysis

Course Outcomes:

CO1	Able to understand OSI and TCP/IP models.
CO2	Understand data link layer protocols and flow control
CO3	Understand routing and network layer protocols and IPV4
CO4	Understand transport layer congestion, flow control and protocols
CO5	Understand application layer protocols

UNIT I : INTRODUCTION

OSI, TCP/IP and other networks models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies WAN, LAN, MAN.

PHYSICAL LAYER Transmission media copper, twisted pair wireless, switching and encoding asynchronous communications

UNIT II: DATA LINK LAYER:

Design issues, framing, error detection and correction, CRC, Elementary Protocol-stop and wait, Sliding Window. Medium Access Sub Layer: ALOHA, MAC addresses, Carrier sense multiple access, IEEE 802.X Standard Ethernet, Bridges.

UNIT III: NETWORK LAYER

Virtual circuit and Datagram subnets-Routing algorithm shortest path routing, Flooding, Hierarchical routing, Broad cast, Multi cast, distance vector routing. OSPF. IPV4

UNIT IV TRANSPORT LAYER

Transport Services, Connection management, TCP and UDP protocols congestion control.

UNIT V APPLICATION LAYER

Network Security, Domain name system, SNMP, Electronic Mail; the World WEB, Multi Media.

Text Book:

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. www.tutorialspoint.com
2. nptl.ac.in/courses/

Course Title: Design and Analysis of Algorithms

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

Prerequisites: None

Course Objectives

- 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 Completion of the course, the students 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	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-
CO4	3	2	-	2	-	-	-		-	-	-	-	-	2	-
CO5	3	-	2	-	2	-	-	2	2	2	-	-	2	-	2
CO6	3	-	3	3	-	-	-	-	-	-	-	-	3	3	3

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.

UNIT II Divide and Conquer: Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Finding the Maximum and Minimum
Unit III **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 IV 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 V 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
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,Pearsoh education. 4. Algorithms – Richard Johnson Baugh and Marcus Schaefer, Pearson Education

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Course Code-Cloud Computing

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

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

Course Objectives:

The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Course Outcomes:

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

CO1	Understanding the key dimensions of the challenge of Cloud Computing
CO2	Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
CO3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
CO4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
CO5	Describe the features of Resource Management systems

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

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

UNIT-1: 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

UNIT-2: 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-3: 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.

UNIT-4 :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-5: Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

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. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press

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**
2. https://onlinecourses.nptel.ac.in/noc21_cs87/preview

Course Title: Software Testing Methodologies and Tools

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

Prerequisites: Software Engineering

Course Objectives

Fundamentals for various testing methodologies.

- 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	Understand the basic testing procedures.
CO2	Able to support in generating test cases and test suites.
CO3	Able to test the applications manually by applying different testing methods and automation tools..
CO4	Apply tools to resolve the problems in Real time environment.

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

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-							-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-							2	2	-
CO4	3	3	2	-	-	-							-	2	3

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.

UNIT II:

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques. Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains andInterfaces Testing, Domain and Interface Testing, Domains and Testability

UNIT III:. Paths, Path products and Regular expressions: Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

Syntax Testing: Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips

UNIT IV:. Logic Based Testing: Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

State, State Graphs and Transition Testing: State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

UNIT V: Software Testing Tools: Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

Text Book

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

REFERENCE BOOKS:

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

Course Title: Data Warehousing and Data Mining

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

Prerequisites: Data Structures

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	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	-	-	-	-	-	-	-	2	-	-	2
CO2	2	2	-	3	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	-	3	2	-	-	-	-	-	-	2	2	2	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	-	2	3

UNIT I: DATAWAREHOUSING AND BUSINESSANALYSIS

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 OVERVIEW AND ADVANCEDPATTERN MINING

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 AND PREDICTION

Classification: Introduction, Decision tree induction, Bayesian Classification, Rule-Based Classification, Techniques to improve Classification Accuracy, Classification by Back propagation, Support Vector Machines

UNIT IV: CLUSTERING ANALYSIS

Cluster Analysis: Introduction, overview of basic clustering methods, Partitioning methods, Hierarchical methods, Density-Based Methods: DBSCAN& OPTICS, introduction to outlier analysis

UNIT V: WEB AND TEXT MINING

Multidimensional Analysis and Descriptive Mining of Complex Data Objects-Introduction, web mining, web content mining, web structure mining, we usage mining; Text mining, unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering.

Text Books

[1].Jiawei Han and Micheline Kamber, -Data Mining Concepts and Techniquesl, Third Edition, Elsevier, 2012.

REFERENCE BOOKS:

[1].G.K.Gupta,—IntroductiontoDataMiningwithCaseStudiesl,EasterEconomyEdition,Prentice Hall of India, 2006

[2].APang-Ning Tan, Michael Steinbach and Vipin Kumar, -Introduction to DataMiningl, Second Edition Pearson Education, 2016

[3].K.P. Soman, ShyamDiwakar and V. Ajay -Insight into Data mining Theory and Practicel, Easter Economy Edition, Prentice Hall of India, 2006

E-RESOURCES

Data Warehouse Tutorial For Beginners | Data Warehouse Concepts | Data Warehousing | Edureka (2017)https://www.youtube.com/watch?v=J326LIUrZM8&t=4s

How Artificial Neural Network (Ann) Algorithm Work | Data Mining | Introduction To Neural Network(2016)https://www.youtube.com/watch?v=fwnaijgpih,

Course Title: Advanced Data Structures

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

Prerequisites: Data Structures

Course Objectives

- Describe and implement a variety of advanced data structures (hash tables, priority queues, balancedsearch 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 differentsolutions.

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-
CO6	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3

Dictionaries: Sets,Dictionaries,Static Hashing- Hash Table, Hash Functions- Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques

UNIT II: Dynamic Hashing and Skip Lists

Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Hash Table Restructuring, Skip Lists,Analysis of Skip Lists.

UNIT III: 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 IV: Priority Queues

Binary Heaps : Implementation of Insert and Delete min, Creating Heap.
Binomial Queues : Binomial Queue Operations, Binomial Amortized Analysis, Lazy BinomialQueues

UNIT V: 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 Book 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 Title: Computer Networks Lab

Lecture – Practical::	**Tutorial-** 0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

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 (like netstat, 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 Title: Artificial Intelligence Lab

Lecture–Tutorial-Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: Artificial Intelligence concepts

Course Objectives

- To provide skills for designing and analyzing AI based algorithms.
- To enable students to work on various AI tools.
- To provide skills to work towards solution of real life problems.

CourseOutcomes:
UponCompletionofthecourse,thestudentswillbeableto

CO1: Elicit, analyze and specify software requirements.
CO2: Simulate given problem scenario and analyze its performance.
CO3: Develop programming solutions for given problem scenario.

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	PO12	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	-	-	-	-	2	-	-	2	-	-
CO2	3	2	-	2	-	-	-	-	2	-	2	-	-	3	-
CO3	3	-	2	-	-	-	-	2	-	-	-	-	-	3	-

List of Experiments

Use any language such as C/C++/LISP/PROLOG

1. Solve "Water Jug Problem".
2. Write a program to solve 8 queens' problem
3. Solve any problem using depth first search.
4. Solve any problem using best first search.
5. Solve 8-puzzle problem using best first search
6. Write A Program to Generate the output for A* Algorithm
7. Write a program to implement tower of Hanoi
8. Write predicates One converts centigrade temperatures to Fahrenheit, the'other checks if a temperature is below freezing.
9. Write a program to solve the Monkey Banana problem
10. Write a program to solve Hill climbing.
11. Implementation of searching techniques in AI.
12. Installation and working on various AI tools viz. Python, R tool, GATE, NLTK, MATLAB, etc.
13. Data preprocessing and annotation and creation of datasets.
14. Learn existing datasets and Treebanks
15. Implementation of Knowledge representation schemes.
16. Application of Classification and clustering problem.
17. Natural language processing tool development.

Note: The concerned Course Coordinator will finalize the actual list of experiments/problems at the start of semester based on above generic list.

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Course Title: DEVOPS LAB

Lecture – Practical:	0-0-4	**Internal Marks:**	15
Credits	2	**External Marks:**	35

Prerequisites:
Working knowledge of one or more high-level programming languages (C#, Java, PHP, Ruby, Python, etc.) Intermediate knowledge of administering Linux or Windows systems at the command-line level

Course Objectives : The Objective of this course is to give a strong foundation of the Development and its Operations.

Course Outcomes

Upon successful completion of the course, the student will be able to: Understand the traditional software development. Learn the rise of agile methodologies.• Define and design purpose of DevOps.•

CO1	Realize the importance of agile software development practices in determining the requirements for a software system
CO2	Analyze and execute iterative software development processes to manage software development activities.
CO3	Apply a systematic understanding of Agile principles and defined practices for a specific circumstance or need.
CO4	Examine the impact of DevOps in the successful completion of software development by improving team collaboration and software quality.
CO5	Perform software process improvement by applying DevOps capabilities at enterprise level.

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	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	2	2	-	-		3	2	3	3
CO2	2	3	2	3	-	-	-	-	-	-	2	3	3	3	3
CO3	2	2	3	3	2	-	2	-	2	-	2	-	2	-	3
CO4	2	-	2	2	2	-	2	-	-	-	-	3	2	3	-
CO5	-	-	2	2	2	-	3	-	2	-	2	3	3	3	3

PROGRAMS LIST

1) **In-depth knowledge of DevOps methodology**
2) **Implementing Software Version Control**
3) **Containerizing Code on production using Docke**
4) **Creating CI/CD Pipelines using Jenkins**
5) **Configuration Management using Puppet and Ansible**
6) **Automating build and test using Selenium and Maven**
7) **Container Orchestration using Kubernetes**
8) **Performance Tuning and Monitoring using Nagios**
9) **Devops Tools : Jenkins,Docker. Phantom.,NagiosVagrant,Ansible,GitHub.**

Course Code-Employability Skills-I

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

Prerequisites: None

Course Objectives:

1.To explore and practice basic communication skills

2.To learn skills for effective discussions & team work

3.To assess and improve personal grooming

Course Outcomes

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

CO1	Establish effective communication with employers, supervisors, and co-workers
CO2	Identify to explore their values and career choices through individual skill assessments
CO3	Adapts positive attitude and appropriate body language
CO4	Interpret the core competencies to succeed in professional and personal life

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	PO12	PSO1	PSO2	PSO3
CO1								2		2					
CO2								2							
CO3										2					2
CO4								2		2		2			

UNIT I: Soft Skills:

An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue.

Unit 2: Positivity and Motivation:

Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels

UNIT III: Interpersonal Communication:

Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; listening skills; essential formal writing skills; corporate communication styles, assertion, persuasion, negotiation.

UNIT IV: Public Speaking:

Skills, Methods, Strategies and Essential tips for effective public speaking.Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective.

UNIT V: Non-Verbal Communication

Importance and Elements; Body Language. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

REFERENCE BOOKS:

1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018. 4) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
5) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

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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/D	Total	CIA	SEA	Total	
1	20A3205403	Machine Learning	3	0	0	3	30	70	100	3
2	20A3205402	Compiler Design	3	0	0	3	30	70	100	3
3	20A3205401	Cryptography and Network Security	3	0	0	3	30	70	100	3
4	20A320560	OE-2	3	0	0	3	30	70	100	3
	20A320551	PE-2	3	0	0	3	30	70	100	3
6	20A3205491	Machine Learning Lab	0	0	3	3	15	35	50	1.5
7	20A3205492	R Programming lab	0	0	3	3	15	35	50	1.5
8	20A3205493	Compiler Design Lab	0	0	3	3	15	35	50	1.5
9	20A3205991	MEAN Stack Technologies	0	0	4	4	15	35	50	2
10	20A3205801	Employability Skills - 2	2	0	0	2	30	70*	100	0
Total			17	0	13	30	240	560	800	21.5
Honors/Minor courses - 3			**3**	**0**	**2**	**5**	30	70	100	**4**
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

Code	Professional Elective -2
20A3205511	2.1 Advanced Database Management Systems
20A3205512	2.2 Network Programming
20A3205513	2.3 Big data Analytics
20A3205514	2.4 Object Oriented Analysis and Design

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Course Title: Machine Learning

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

Prerequisites: Calculus and Probability

Course Objectives

1. Explain about data preprocessing and its uses in prediction
2. Explain how linear models are learning from the data.
3. Explain the Improving efficiency of the models using nonlinearity and ensembles
4. Explain how neural networks help in increasing efficiency

Course Outcomes

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

CO1	Understanding the machine learning basics and how data is preprocessed
CO2	How linear models help in prediction
CO3	Distance based models complexity
CO4	Probabilistic models understanding
CO5	Nonlinear models and ensembles improve efficiency

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	2	2	-	-	-	-	-	-	-	-	-	3	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	2	3
CO5	2	2	3	2	2	2	-	-	-	-	-	-	3	3	-

UNIT I The Ingredients of Machine Learning:
Introduction to Machine Learning, Types of Machine Learning, Models - The output of Machine Learning
Binary Classification and related tasks: Classification, Calculating accuracy in classification.

UNIT II(NLP):
Text data preprocessing, Bag of words, TF IDF, Word2vec, Plane and Hyper-plane for machine learning, Data Cleaning, Data Preprocessing (Min – Max Scaling), Normalizing, Standardize, Mean, Variance, Standard Deviation, One Hot Encoding

Unit III :

Beyond Binary Classification: Handling more than two classes, finding minimum and maximum of a function, Gradient

Descent, Linear Regression, Multiple Regression, Calculating accuracy in regression (RMSE), Effect of outliers and noisy data, overfitting and underfitting models, K-fold cross validation, confusion matrix for cross validation imbalanced data, ROC_AUC curve for imbalanced data, F1 score

UNIT IV :

Logistic Regression: Sigmoid function in logistic regression, loss functions in logistic regression.
Linear Models: The Least Square method, Support Vector Machine (SVM)
Tree Model: Decision Trees, Ranking and Probability estimation trees,

UNIT V :

Distance Based Models: Distance Measures (Euclidean, Manhattan and Minkowski), Neighbors, KNN, Distance based clustering, Hierarchical Clustering, Agglomerative Clustering
Probabilistic model: Naive Bayes algorithm for classification, Laplace, smoothing
Model Ensembles: Bagging and Random Forest, Boosting

Text Book

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

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1.https://alex.smola.org/drafts/thebook.pdf
2.https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045

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Title of the Course: Compiler Design

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

Prerequisites: Formal Language and Automata Theory

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	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
CO2	To apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
CO3	To write the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO4	To employ the knowledge of modern compiler & its features.
CO5	To 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	3	3						-	2
CO2	2	3	3	2	2	2				2	2	3
CO3	3	3	3	3	3	2						2

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

UNIT I :

Overview of Compilation: Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA. Interpretation, bootstrapping, LEX - lexical analyzer generator and Boot Strapping.

UNIT II:

SYNTAX ANALYSIS: Context free grammars, Top down parsing – Backtracking, LL (1), Recursive Descent Parsing, Predictive Parsing. Bottom up Parsing: Shift Reduce parsing, LR and LALR parsing, Operator Precedence parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator.

UNIT III:

Semantic analysis: Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Type checker.

Symbol Tables: Symbol table format, organization for block structures languages. Block structures and non block structure storage allocation: static, runtime stack and heap storage allocation.

UNIT IV:

RUN-TIME ENVIRONMENT AND CODE GENERATION :

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management – Issues in Code Generation – Design of a simple Code Generator.

UNIT V:

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.

Principal Sources of Optimization – Peep-hole optimization – DAG- Optimization of Basic Blocks-Global Data Flow Analysis – Efficient Data Flow Algorithm.

TEXT BOOKS:

1. Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, "Compilers Principles, Techniques & Tools", 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

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Course Title: Cryptography and Network Security

Lecture–Tutorial-Practical::	3-0-0	**InternalMarks:**	30
Credits:	3	**ExternalMarks:**	70

Prerequisites: Students are expected to have knowledge on the following topics: Engineering Mathematics, Number Theory, Computer Networks, Problem Solving Skills, Web Technologies

Course Objectives

1. The Objectives of first unit is to present an overview of the main concepts of cryptography, understand the threats & attacks, understand ethical hacking
2. The Objectives of second unit is to understand the difference between stream ciphers & block ciphers, present an overview of the Feistel Cipher and explain the encryption and decryption, present an overview of DES, Triple DES, Blowfish, IDEA
3. The objectives of third unit is to present the basic principles of public key cryptography, Distinct uses of public key cryptosystems
4. The objectives of fourth unit is to Present overview of the basic structure of cryptographic functions, Message Authentication Codes, Understand the operation of SHA-512, HMAC, Digital Signature
5. The objectives of fifth unit is to Present an overview of techniques for remote user authentication, Kerberos, Summarize Web Security threats and Web traffic security approaches, overview of SSL & TLS. Present an overview of electronic mail security.
6. The objectives of fifth unit is to Provide an overview of IP Security, concept of security association, Intrusion Detection Techniques

CourseOutcomes:

UponCompletionofthecourse,thestudentswillbeableto

CO1. Understand the principles of cryptography and security, with enciphering Techniques and analyze a variety of threats and attacks.

CO2. Distinguish the black ciphers and stream ciphers and apply them on a various symmetric cryptographic technique.

CO3. Understand the principle and mathematical models used in public-key cryptosystems by applying them on different (various) types of algorithms.

CO4. Analyze the message authentication functions with its types and digital certifications for secure communication.

CO5. Understand the user authentications principles and security approach at both the web and email.

CO6. Understand the concept of IP Security with its services and dealing with the prevention and detection of intrusions.

Unit–I

Introduction, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Mathematics of Cryptography

Classical Encryption Techniques, Symmetric Cipher Model,Substitution Techniques, Transposition Techniques

UNIT II:

Symmetric Encryption, Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard, BlowFish, IDEA, CAST-128 algorithms

UNIT III:

Asymmetric Encryption, Mathematics of Asymmetric Key Cryptography, Number Theory, Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Asymmetric Key Ciphers Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem, EllipticCipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode, Counter Mode,

UNIT IV:

DATA INTEGRITY, Digital Signature schemes, & Key Management

Message Integrity and message authentication, Cryptographic hash functions, Digital Signature and Key Management

UNIT V:

Network Security: Security at Application layer: PGP and MIME, Security at Transport layer: SSL and TLS, Security at Network layer: IPSec, System Security

Text Book:

1. Cryptography and Network Security Principles and Practice 6th Edition, William Stallings, Pearson Education
2. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, 3E) Mc Gra Hill
3. AtulKahate, Cryptography and Network Security, TMH. (2003)

REFERENCE BOOKS:

1. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
2. Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in Public World, 2 nd Edition,2011, Pearson Education. 95
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning

E-RESOURCES:

1. http://users.abo.fi/ipetre/crypto/
2. https://www.vssut.ac.in/lecture_notes/lecture1428550736.pdf
3. https://analyticsindiamag.com/top-10-free-resources-to-learn-cybersecurity/
4. https://lecturenotes.in/subject/112/cryptography-and-network-security-cns
5. https://www.smartzworld.com/notes/cryptography-network-security-notes-pdf-cns-notes-pdf/
6. https://studentsfocus.com/cs6701-cns-notes-cryptography-network-security-lecture-handwritten-notes-cse-7th-sem-anna-university/
7. https://www.jntufastupdates.com/jntuk-r16-4-1-cns-material/

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Course Title: Advanced Database Management Systems

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

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.

UNIT – II

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-III

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 – IV

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 – V

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 Title: Network Programming

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

Prerequisites: None

Course Objectives

- Students will gain the understanding of core network programming by using sockets and transport layer protocols like TCP and UDP
- Students will gain the understanding of inter process communication and implementation of different forms of IPC in client-server environment
- Students will get an exposure to various application layer protocols which are designed using sockets and transport layer protocols

Course Outcomes

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

CO1	Explain the client-server paradigm and socket structures.
CO2	Describe the basic concepts of TCP sockets and TCP echo client-server programs.
CO3	Discuss the UDP sockets and UDP echo client-server programs.
CO4	Explain Socket options and ability to understand IPC.
CO5	Apply the applications of sockets and demonstrate skill to design simple applications like FTP, TELNET etc.

UNIT I:

Introduction to Network Programming: OSI model-transport layer protocols: TCP, UDP and SCTP-network architecture: client-server and peer-to-peer systems, Sockets-socket Address structures: IPv4, IPv6 and Generic-value result arguments-Byte ordering functions-Byte manipulation functions-Address conversion functions

UNIT II:

TCP: introduction to TCP-TCP connection establishment and terminationTIME_WAIT State. Elementary TCP sockets – Socket-connect-bind-listen-accept-fork-exec function-concurrent servers-Close function-read and write functions

UNIT III:

TCP echo client server program-getsockname and getpeername functions I/O multiplexing: I/O models-Select function-TCP echo server using select function-shutdown function-Poll function

UNIT IV:

UDP: Introduction to UDP-difference between TCP and UDP-recvfrom( ) and sendto( ) functions-UDP echo client server program-UDP echo client server using select function. Socket Options: IPv4 socket options-IPv6 socket options

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Course Title: Big Data Analytics

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

Prerequisites: None

Course Objectives

- To understand the need and application of Map Reduce.
- To understand the various search algorithms applicable to Big Data.
- To analyze and interpret streaming data.
- To learn how to handle large data sets in main memory.
- To learn the various clustering techniques applicable to Big Data.

Course Outcomes

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

CO1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing
CO2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics
CO3	Students Interpret business models and scientific computing paradigms, and apply software tools for big data analytics
CO4	Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media 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	PO12	PSO1	PSO2	PSO3
CO1	2			3			2					2	2		
CO2				3					3						2
CO3		3				3				2				3	
CO4				3					2			2	2		

UNIT I:

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Mode

UNIT II:

Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Trée Algorithms — Evaluating a Decision

Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier.

UNIT III:

Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV:

Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V:

NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding — Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R

Text Book:

1. Jure Leskovec, AnandRajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.

REFERENCE BOOKS:

1. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
2. Ian H.Witten, Eibe Frank "Data Mining – Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
3. David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT Press,2001

E-RESOURCES

Big Data Analytics Tutorial (tutorialspoint.com)
Big Data Analytics Notes Pdf Download & List of Reference Books for BDA (ncertbooks.guru)

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Course Code-OBJECT ORIENTED ANALYSIS AND DESIGN

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

Prerequisites:

No particular skills are required as a prerequisite before learning UML.

Course Objectives:

- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language
- Specify, analyze and design the use case driven requirements for a particular system.
- Model the event driven state of object and transform them into implementation specific layouts.
- Identify, Analyze the subsystems, various components and collaborate them interchangeably.

Course Outcomes:

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

CO1	Analyse, design, document the requirements through use case driven approach
CO2	Identify, analyse, and model structural concepts of the system
CO3	Develop,explore the conceptual model into various scenarios and applications.
CO	Apply the concepts of architectural design for deploying the code for software.
CO5	Identify, analyse, and model Architectural concepts of the system

UNIT I :

Introduction to UML:

The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, genericity, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture

UNIT II:

Basic structural Modeling: Classes, relationships, common mechanisms, diagrams, Advancedstructural modeling: advanced relationships, interfaces, types & roles, packages, instances.

Class & object diagrams: Terms, concepts, examples, modeling techniques, class & Object diagrams.

UNIT III:

Collaboration diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages.

Sequence diagrams: Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

UNIT IV:

Behavioral Modeling: Interactions, use cases, use case diagrams, activity diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, processes & threads, time and space, state chart diagrams.

UNIT V:

Architectural Modeling: Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

TEXT BOOKS:

1. The Unified Modeling Language User Guide, Grady Booch, Rambaugh, Ivar Jacobson, PEA

2. Fundamentals of Object Oriented Design in UML, Meilir Page- Jones, Addison welson

REFERENCE BOOKS:

1. Head First Object Oriented Analysis &Design, Mclaughlin, SPD OReilly,2006

2. Object oriented Analysis& Design Using UML, Mahesh ,PHI

3. The Unified Modeling Language Reference Manual, 2/e, Rambaugh, GradyBooch,etc., PEA

4. Object Oriented Analysis & Design, Satzinger, Jackson, Thomson

5 Object Oriented Analysis Design & implementation, Dathan.,Ramnath, University Press

6. Object Oriented Analysis & Design, John Deacon, PEA

7. Fundamentals of Object Oriented Analysis and Design in UML, M Pages-Jones, PEA

8. Object-Oriented Design with UML, Barclay, Savage, Elsevier,2008

E-RESOURCES: www.numpy.org
www.pandas.org

Course Title: Machine Learning Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	75

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 machine learning models and using different accuracy techniques to improve the prediction percentage.

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

CO1 Should be able to do data cleaning and data preprocessing
CO2 Should be able to apply imbalanced data sets accuracy
CO3 Should be able to apply machine learning techniques to large data sets

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. Implement data cleaning techniques
2. Implement data preprocessing techniques.
3. Make your data ready for model training.
4. Train, validate and test KNN model using gridsearchcv
5. Train, validate and test naïve bayes model
6. Train Validate and test logistic regression model.
7. Train Validate and test SVM model.
8. Train Validate and test random forest ensemble.

TEXT BOOKS:

1) **Hands-On Machine Learning with Scikit-Learn, Keras and Tensor Flow: Concepts, Tools and Techniques to Build Intelligent Systems (Colour Edition) Paperback – 23 October 2019 by AurelienGeron(Author)**
2) **Introduction to Machine Learning with Python: A Guide for Data Scientists (Greyscale Indian Edition) Paperback – 1 January 2016 by Andreas Muller**

E-RESOURCES:

www.numpy.org
www.pandas.org

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Course Code-R Programming Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

Course Objectives:

1. Learn the fundamentals of 'R'.
2. Use of Sorting and Searching techniques.
3. Learn the basic Statistical functions.
4. Use of Classifications.
5. Applications of Regressions.

Course Outcomes:

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

CO1	Perform basic 'R' operations.
CO2	Understand the Sorting and Searching techniques.
CO3	Perform Statistical functions on datasets.
CO4	Apply Classification and Regression techniques.
CO5	Perform Clustering.

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

List of Experiments

1. Implementation of Data Frames and Lists.
2. Implementation of Matrix operations.
3. Implementation of Factors.
4. Implementation of Quick Sort, Merge Sort.
5. Implementation of Binary Search Tree.
6. Implementation of Reading and Writing files.
7. Implementation of Descriptive and Summary Statistics.
8. Implement Charts- Bar(Side by Side,Stacked), Line.
9. Implementation of Correlation, T-test, ANOVA.
10. Implementation of Decision tree, Support Vector Classifications.
11. Implementation of Linear, Random Forest Regressions.
12. Implementation of Clustering.

Code-Complier Design Lab

Lecture – Tutorial- Practical::	0-0-3	**Internal Marks:**	15
Credits:	1.5	**External Marks:**	35

Prerequisites: C- Programming, Data Structures, Statistics fundamentals

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	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
CO2	To apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
CO3	To write the new code optimization techniques to improve the performance of a program in terms of speed & space.
CO4	To employ the knowledge of modern compiler & its features.
CO5	To 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	--	3	--	--	--	--	--	--	
CO2	3	2	3	--	2	--	--	--	--	--	--	--
CO3	2	2	3	--	--	--	--	--	--	--	--	
CO4	3	-3	2	2	2	--	--	--	--	--	--	--
CO5	2	3	3	3	2	--	--	--	--	--	--	

List of Experiments

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.

Course Title: MEAN STACK TECHNOLOGY -LAB

Lecture – Practical:	0-0-4	**Internal Marks:**	15
Credits	2	**External Marks:**	35

- **Prerequisites:**
- To have basic knowledge on developing web applications
- Knowing HTML and CSS web languages
- JavaScript, IDE or Text Editor, Command Line Interface (CLI)
- Server-side development with any programming language.

Course Objectives : The Objective of this course is to give a strong foundation of the Development and its Operations.

Course Outcomes

Upon successful completion of the course, the student will be able to:
1.Understand the traditional software development.
2.Learn the rise of agile methodologies.
3.Define and design purpose of DevOps.

CO1	To code a MEAN Stack Application
CO2	Developing Single Page Applications (SPAs) via MEAN Stack
CO3	Setup routing within Angular & Express
CO4	Write Express Back-End Web Services with Express & Node
CO5	Employ Express Web Services
CO6	Understanding Mango DBMS

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	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-						3	-	-	2
CO2	3	2	2	2	-	-							-	3	2
CO3	2	2	3	2	-	-						3	2	2	-
CO4	3	3	2	-	-	-							-	2	3
CO5	2	2	3	2	2	2							1	3	-
CO6		3		3	3	3						3	3	3	3

List of Experments

- Angular :
- Getting Started with Angular
- Introduction to Components
- Templates, Interpolation, and Directives
- Data Binding & Pipes
- More on Components
- Building Nested Components
- Forms
- Services and Dependency Injection
- Retrieving Data Using HTTP

Navigation and Routing Basics

- Node Js :
- Introduction
- Exploring language additions to the V8 JavaScript engine
- Understanding NodeJS
- HTTP and File System
- Buffers, Streams, and Events
- Using Express Framework
- Working with Models, Views, and Routes
- Database
- Working with MongoDB
- Working with RESTful web services

Angular With Node

Course Title: EMPLOYABILITY SKILLS –II

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

Prerequisites: None

Course Objectives

- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

Course Outcomes

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

CO1	Recite the corporate etiquette.
CO2	Make presentations effectively with appropriate body language
CO3	Be composed with positive attitude
CO4	Apply their core competencies to succeed in professional and personal life

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	PO12	PSO1	PSO2	PSO3
CO1	2			3			2			2		2	2		
CO2				3					2						2
CO3		3				2				3				3	
CO4				3					2	3		2	2		

UNIT I:

Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness

UNIT II:

Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips. Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

UNIT III:

Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and

Causes; Methods of Conflict Resolution.

UNIT IV:
Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills.

UNIT V: Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence

Text Book:
1) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.

REFERENCE BOOKS:
1) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
2) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
3) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
4) R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
5) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

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COURSE STRUCTURE

I MBA I SEMESTER

S.No.	Course Code	Course Title	L	M	P	C	I	E	T
1	22E1198401	Management and Organizational Behavior	4	0	0	4	25	75	100
2	22E1198402	Managerial Economics	4	0	0	4	25	75	100
3	22E1198403	Accounting for Managers	4	0	0	4	25	75	100
4	22E1198404	Quantitative Analysis for Business Decisions	4	0	0	4	25	75	100
5	22E1198405	Legal and Business Environment	4	0	0	4	25	75	100
6	22E1198406	Business Communication and Soft skills	4	0	0	4	25	75	100
7	OPEN ELECTIVE 22E1198511 22E1198512 22E1198001	Cross Cultural Management Rural Innovation Projects MOOCs:SWAYAM/NPTEL-Related to Management Courses other than listed courses in the syllabus	4	0	0	4	25	75	100
8	22E1198491	Information Technology LAB & Tally	0	0	2	2	20	30	50
9	22E1198492	Business Communication & Soft Skills LAB	0	0	2	2	20	30	50
			28	0	4	32	215	585	800

L: Lecture **M**: Mini Project **P**: Practicals **C**: Credits

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I MBA I SEMESTER

22E1198401 Management and Organizational Behavior

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
Course Objectives	1. To familiarizing the students with the basic concepts of Management. 2. To help the students gain understanding of the functions and responsibilities ofmanagers. 3. To provide them tools and techniques to be used in the performance of themanagerial job. 4. To enable them to analyze and understand the environment of the organization. 5. To help the students to develop cognizance of the importance of managementprinciples.		
Course Outcomes:	**CO1:** To acquire knowledge on the principles and functions of management. **CO2:** To familiarize techniques of Motivation, Leadership, Communication and control. **CO3:** To analyze individual behavior variables like personality perception attitudes and values in the context of OB. **CO4:** To analyze Group dynamics in the area of conflicts, power and politics, Team building. **CO5:** To master the structure variables like Change management, OD, Culture and climate towards updating organizational effectiveness. **CO6:** Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.		

Courses Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2										
CO2	1			2					2			
CO3	1		2								2	
CO4	1			2			1		2			
CO5	1			2		2				1		
CO6	1		2					1			1	
Total	7	2	4	6		2	1	1	4	1	3	
Average	2.00	2.00	2.67	3.00		2.00	1.00	1.00	2.67	1.00	2.00	

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Unit – I

Definition, Nature, Functions and Importance of Management -Evolution of Management thought – Scientific management, administrative management, Haw throne experiments – systems approach - Levels of Management - Managerial Skills - Planning – Steps in PlanningProcess – importance and Limitations – Types of Plans - Characteristics of a sound Plan - Management By Objectives (MBO) - Techniques and Processes of Decision Making - Social Responsibilities of Business

Unit-II

Organizing – Principles of organizing – Organization Structure and Design – Types of power-Delegation of Authority and factors affecting delegation – Span of control – Decentralization – Line and staff structure conflicts - Coordination definition and principles -Emerging Trends in Corporate Structure – Formal and Informal Organization- Nature and importance of Controlling, process of Controlling, Requirements of effective control and controlling techniques.

Unit – III

Organizational behavior: Nature and scope – Linkages with other social sciences – Individualroles and organizational goals – perspectives of human behavior - Perception– perceptual process – Learning - Learning Process- Theories - Personality and Individual Differences - Determinants of Personality - Values, Attitudes and Beliefs - Creativity and Creative thinking.

Unit – IV

Motivation and Job Performance – Content and process Theories of Motivation - Leadership- Styles - Approaches – Challenges of leaders in globalized era – Groups – stages formation of groups – Group Dynamics - Collaborative Processes in Work Groups - Johari Window- Transactional Analysis.

Unit – V:

Organizational conflict-causes and consequences-conflict and Negotiation Team Building, Conflict Resolution in Groups and problem solving Techniques – Organizational change - change process - resistance to change - Creating an Ethical Organization.

Relevant cases have to be discussed in each unit and in examination case is compulsoryfrom any unit.

References:

1. Harold Koontz, Heinz Weihrich, A.R.Aryasri, Principles of Management,TMH, 2010.
2. Dilip Kumar Battacharya, Principles of Management, Pearson, 2012.
3. Kumar, Rao, Chhaalill -Introduction to Management Sciencel Cengage Publications,New Delhi
4. V.S.P.Rao, Management Text and Cases, Excel, Second Edition, 2012.
5. K.Anbuvelan, Principles of Management,University SciencePress, 2013.
6. K.Aswathappa — Organisational Behaviour-Text, Cases and Gamesl, Himalaya Publishing House, New Delhi,2008.
7. Steven L Mc Shane, Mary Ann Von Glinow,Radha R Sharma: —Organisational Behaviourl, TMH Education, New Delhi,2008

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22E1198402 MANAGERIAL ECONOMICS

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4

COURSE OBJECTIVES	1. To inculcate the basic knowledge of the concepts economics to make them effective decision makers 2. To a rigorous foundation in microeconomics which becomes the basis for a way of thinking about managerial problems. 3. To examine market behavior and focus on the actions and reactions of business firms and consumers in a variety of market environments. 4. To emphasize the quantitative and qualitative applications of economic principles to business analysis.
Course Outcomes:	**CO1:** Define micro, as well as macroeconomic concepts that are useful in business decision making. **CO2:** Outline various business situations with the help of various economic concepts. **CO3:** Relate the application of modern principles and methods of microeconomics to real-world business problems in different contexts. **CO4:** Explain the basic tools of microeconomics: supply and demand analysis; firms' production and pricing decisions, market equilibrium and market structure analysis. **CO5:** Develop a framework for understanding the role and consequences of government policy in a market economy. **CO6:** Use economic reasoning to explain the strategic choices of individuals or organisation, markets structure in influencing resource allocation for attaining organisational goals.

Courses Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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CO1	1		1		2							
CO2	1	2		2							2	
CO3	1			2	2							1
CO4	1		2				2					
CO5	1					2		3				
CO6	1								2		1	
Total	6	2	3	4	4	2	2	3	2		3	1
Average	1.71	2.00	2.00	2.67	2.67	2.00	2.00	3.00	2.00		2.00	1.00

UNIT-I:
Introduction to Managerial Economics: Nature and Scope- Fundamental Concepts:Incremental reasoning, Concept of Time Perspective, Discounting Principle, Opportunity Cost Principle, Equi -Marginal Concept,- Theory of Firm.

UNIT-II:
Demand Analysis and Forecasting: Concepts of Demand, Supply, Determinants of Demandand Supply. Elasticities of Demand and Supply- Methods of demand forecasting for established and new products.

UNIT-III:
Cost and Production Analysis: Cost: Concept and types, Cost-Output Relationships, CostEstimation, Reduction and Control- Economies and Diseconomies of Scale- Law of Variable Proportions- Returns to Scale- Isoquants-Cobb- Douglas and CES Production functions.

UNIT-IV:
Theory of Pricing: Price determination under Perfect Competition, Monopoly, Oligopolyand Monopolistic Competitions- Methods of Pricing- Game Theory basics- Dominant Strategy-Nash Equilibrium and Prisoner's Dilemma.

UNIT-V:

Macro Economics and Business: Concept, Nature and Measurement of National Income-Inflation and Deflation: Inflation - Meaning and Kinds, Types, Causes and measurement of inflation Measures to Control Inflation, Deflation- - Philips curve- Stagflation-Theory of Employment- Business cycles: Policies to counter Business Cycles.

Relevant cases have to be discussed in each unit and in examination case is compulsoryfrom any unit.

References:

1. D.M.Mithani, Managerial Economics, Himalaya Publishing House
2. H.Craig Peterson, W.Cris Lewis, Managerial Economics, Pearson, 2005.
3. Gupta G.S., Managerial Economics, TMH, 1988.
4. P.L. Mehta, Managerial Economics, PHI, 2001.
5. K .K Dawett, Modern Economic Theory, Sultan Chand & Sons.
6. D.N. Dwivedi, Managerial Economics, 7th Ed, Vikas Publishing.
7. Rangarajan and Dholkia, Macroeconomics, TMH.

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22E1198403 **Accounting for Managers**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To acquaint the students regarding various accounting concepts and its application in managerial decision making. 2. To enable the students understand the various financial and cost accounting principles and their applicability. 3. To introduce prospective managers of new ventures to prepare and analyse financial statements and various budgets. 4. To enable the students to analyze a company's financial statements and come to a reasoned conclusion about the financial situation of the company. 5. To develop the skill of preparing various reports as per the requirements of the various stakeholders.		
Course Outcomes:	**CO1:** Understand the nature and role of the four principal financial statements (i.e., the Income Statement, the Statement of Financial Position, the Statement of Cash Flows, and the Statement of Changes in Equity) ; **CO2:** Develop an awareness and understanding of the accounting process and fundamental accounting principles that underpin the development of financial statements (e.g. accrual accounting vs. cash accounting, definition, recognition, measurement and disclosure of assets, liabilities, revenues, expenses; inventory valuation methods, provisions, depreciation; accounting for intangibles); **CO3:** Ability to read, interpret and analyse financial statements; combine financial analysis with other		

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	information to assess the financial performance and position of a company; **CO4:** Understand and apply course concepts to analyse common business management decisions such as pricing and outsourcing decisions from a financial perspective; **CO5:** Understand the role of budgets in organisations, their limitations and the behavioural issues to consider when developing and using budgets for planning and control; **CO6:** Develop an awareness of the need to consider ethical, social and other relevant issues, in addition to financial information, in the management decision-making process.

Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1		1		2							
CO2	1	2		2							2	
CO3	1			2	2							1
CO4	1		2				2					
CO5	1					2		3				
CO6	2			2					2		1	
Total	7	2	3	6	4	2	2	3	2		3	1
Average	1.17	2	1.5	2	2	2	2	3	2		1.5	1

Unit – I:

Financial Accounting- concept, Importance and scope, accounting principles, accounting cycle, journal ledger, trial balance, Preparation of final accounts with adjustments.

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Unit – II:

Analysis and interpretation of financial statements – meaning, importance and techniques, ratio analysis, Fund flow analysis, cash flow analysis (AS - 3).

Unit – III:

Cost accounting–meaning, importance, methods, techniques; classification of costs and cost sheet; Inventory valuation methods- LIFO, FIFO, HIFO and weighted average method, an elementary knowledge of activity based costing.

Unit – IV:

Management accounting – concept, need, importance and scope; budgetary control-meaning, need, objectives, essentials of budgeting, different types of budgets and their preparation.

Unit-V:

Standard costing and variance analysis (materials, labour)-Marginal costing and its application in managerial decision making, Break Even Analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. MAHESWARI AND MAHESWARI" Financial Accounting", Vikas Publishing House, New Delhi, 2013.
2. Pandey, I.M. Management Accounting, Vikas Publishing House, New Delhi.
3. Horngen, Sundem & Stratton, Introduction to Management Accounting, Pearson Education, New Delhi.
4. Hansen & Mowen, Cost Management, Thomson Learning.
5. Mittal, S.N. Management Accounting and Financial management, Shree Mahavir Book Depot, New Delhi.
6. Jain S.P. and Narang K.L. Advanced Cost Accounting, Kalyani Publishers Ludhiana.
7. Khan M.Y. and Jain, P.K. Management Accounting, TMH, N. Delhi.

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22E1198404 **Quantitative Analysis for Business Decisions**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To provide basic knowledge of analyzing data using various statistical and mathematical techniques for business decisions. 2. To enable better reporting for decision making. 3. To highlight the benefits as well as the limits of quantitative analysis in a real-world context. 4. To orient the students to various statistical models to how and where appropriately they can be applied.		
Course Outcomes:	**CO1:** Relate a formal quantitative approach to problem solving and decision making and acquire the knowledge about mean, median, mode and measures of dispersion. **CO2:** Apply the concepts of probabilistic distributions in solving problems. **CO3:**. Recall the knowledge of hypothesis testing for large and small samples. **CO4:** Extend the ability to solve linear programming problems by graphical and simple methods. **CO5:** Outline quantitative models to decision making and problem analysis, and their interpretations in transportation problems and game theory. **CO6:** Understand how to present the reasonably solid base data for day to day business decisions.		

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Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1	2	2	2	2							
CO2	1		2	3								
CO3	1			3	3							
CO4	1	2	2	3	2							
CO5	1		2				1					1
CO6	1		3									1
Total	6.00	4	11	11	7		1					2
Average	1.00	2.00	2.20	2.75	2.33		1.00					1.00

Unit I

Basic Mathematical & Statistical Techniques: Linear, Quadratic, Logarithmic and Exponential Functions- Permutations and Combinations – Matrices - Elementary operations of matrices.

Unit II

Measures of Central Tendency – Measures of Dispersion –Simple Correlation and Regression Analysis Concept of Probability- Probability Rules – Joint and Marginal Probability – Baye's Theorem- Probability Distributions- Binomial, Poisson, Normal and Exponential Probability Distributions.

UNIT III

Introduction to Decision Theory: Steps involved in Decision Making, different environments in which decisions are made, Criteria for Decision Making, Decision making under uncertainty, Decision making under conditions of Risk-Utility as a decision criterion, Decision trees, Graphic displays of the decision making process, Decision making with an active opponent.

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Unit-IV

Sampling and Sampling Distributions – Estimation – Point and Interval Estimates of Averages and proportions of small and Large Samples –Concepts of Testing Hypothesis—One Sample Test for Testing Mean and Proportion of Large and Small Samples.

Unit-V

Tests Two Samples –Tests of Difference between Mean and Proportions of Small and Large Samples – Chi- square Test of Independence and Goodness of Fitness- Analysisof Variance.

Relevant cases have to be discussed in each unit and in examination case is

compulsoryfrom any unit.

References:

1. N.D.Vohra: -Quantitative Techniques in Managementl, Tata-McGraw Hill Private Limited, New Delhi, 2011.
2. Gupta S.P: —Statistical Methodsl, S. Chand and Sons, New Delhi.
3. Anand Sharma: -Quantitative Techniques for Business decision Makingl, Himalaya Publishers, New Delhi, 2012.
4. D P Apte: -Operation Research and Quantitative Techniquesl, Excel Publication, New Delhi, 2013.
5. Hamdy, A.Taha: —Operations Research: An Introductionl, Prentice-Hall of India, NewDelhi2003.
6. Anderson: -Quantitative Methods for Businessll, Cengage Learning, New Delhi2013.
7. Sancheti, Dc & VK Kapoor, -Business Mathematicsl, S Chand and Sons, NewDelhi.

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22E1198405 **Legal and Business Environment**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To develop an understanding of how various environmental factors influence the business. 2. To acquaint students with the functioning of various international trade organizations scales of business and emerging trends in business. 3. To familiarize students with the various important provisions of Indian Contract Act and Sale of Goods Act. 4. To familiarize students with the various important provisions of Consumer Protection Act and other environmental laws.		
Course Outcomes:	**CO1:** Understand the various environmental factors that influence the business. **CO2:** Relate the influence exerted by international organizations on trade in the light of emerging trends. **CO3:** Utilize the knowledge of Indian Contract Act and other acts. **CO4:** Application of the knowledge of various provisions of consumer protection act for smooth functioning of the business. CO5: Analyze current economic conditions in developing emerging markets, and evaluate present and future opportunities. CO6: Gain knowledge about the operation of different institutions in international business environment.		
Course Outcomes vs. POs Mapping:			

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Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	1	2	2	2	2							
CO2	1		2	3								
CO3	1			3	3							
CO4	1	2	2	3	2							
CO5	1		2				1					1
CO6	1		3									1
Total	6.00	4	11	11	7		1					2
Average	1.00	2.00	2.20	2.75	2.33		1.00					1.00

UNIT-I

Introduction: Concept of Business Environment-Definition-Characteristics-Environmental factors, Importance at national and international level – problems and challenges – Environmental Scanning: Importance, Process of scanning- NITI Aayog: It's Role in Economic Development of India- Technological Environment: Features, Its impact on Business, Restraints on Technological Growth.

UNIT-II

Economic and Political Environment: Concept-Definition of Economic Environment-Economic SystemsRelative merits and demerits of each systems-Economic Policies-Monetary-Fiscal-Industrial policies since independence and their significance – regulatory and promotional framework . Structure of Indian EconomyNature and significance. Economic Planning-Objectives, Merits, Limitations- Concept and Meaning of Political Environment.

UNIT-III

Legal Environment: - Business Law: Meaning, scope and need for Business Law- Source of Business LawIndian Contract Act 1872: Its Essentials, Breach of Contract and remedies. Intellectual Property Rights. Negotiable Instruments Act 1881.

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UNIT-IV

Company Act 2013: Memorandum and alteration of Articles of Association-Partnership Act 1932: Duties of Partners- Dissolution of Partnership-Information Technology Act 2000: Digital signature-Cyber Frauds.

UNIT-V

Miscellaneous Acts: Sales of Goods Act 1930-Sale- agreement to Sale – Implied Conditions and WarrantiesConsumer Protection Act 1986- Competition Act- Environment (Protection) Act 1986- Foreign Exchange Management Act (FEMA)

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Francis Cherunillam, Business Environment, Himalaya Publishers.

2. K.Aswathappa, Essentials of Business Environment, Himalaya Publishers.

3. P.K.Dhar, Indian Economy Growing Dimensions, Kalyani Publishers 4.

4. N.D.Kapoor , Mercantile Law, Sultan Chand Publishers.

5. Chaula and Garg, Mercantile Law, Kalyani Publishers

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22E1198406 **Business Communication and Soft skills**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To develop competence in oral, written, and visual communication. 2. To improve understanding of opportunities in the field of communication. 3. To equip with current technology related to the communication field. 4. To enhance effectiveness of cross cultural communication.		
Course Outcomes:	**CO1:** Define the role and process of business communication. **CO2:** Compare and differentiate between formal and informal communication. **CO3 :**Take part in and manage interpersonal communication. **CO4:** Make use of the techniques of effective communication in letter and report preparation. **CO5:** Utilize communication skills effectively in presentations and interviews **CO6:** To stimulate their Critical thinking by designing and developing clean and lucid writing skills.		

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Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2								2	2		
CO2	1	2	2							2		
CO3	1								3		3	
CO4	1			2			3					
CO5	1		2								2	
CO6	1		3									1
Total	7	2	7	2			3		5	4	5	1
Average	2.00	2.00	3.50	2.00			3.00		4.00	3.00	3.33	1.00

Unit – I

Purpose and process of communication: Objectives of Communication-Process of Communication- Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

LAB: LISTENING AND SPEAKING SKILLS- Conversational skills (formal and informal) – group discussion. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on YouTube.(Presenting before the class).

Unit – II

Managing Organizational Communication: Formal and Informal Communication- Interpersonal and Intrapersonal communication- Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory-Gateways for Effective Interpersonal Communication.

LAB: Choosing the organization – goal setting - time management — leadership traits – team work – communicating across teams- designing career and life planning.

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Unit – III

Non verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes-across different cultures.

LAB: Understanding Body Language Aspects and presenting oneself to an interviewer, Proper handshakes.

Unit – IV

Written communication: mechanics of writing, report writing- business correspondence-business letter format- Meetings and managing meetings- Resume writing-Formats and Skills.

LAB: Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

Unit- V

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness –strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

LAB: Designing presentations and enhancing presentation skills.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References: 1.Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.

2.Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.

3.Meenakshi Rama: "Business Communication", Oxford University Press, NewDelhi

4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai

5. Paul Turner: "Organisational Communication", JAICO Publishing House, New Delhi.

6. SathyaSwaroopDebasish, Bhagaban Das" "Business Communication", PHIPrivate Limited, New Delhi, 2009.

7. R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi, 2012

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22E1198511

OPEN ELECTIVE: Cross Cultural Management

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To develop competence in oral, written, and visual communication. 2. To improve understanding of opportunities in the field of communication. 3. To equip with current technology related to the communication field. 4. To enhance effectiveness of cross cultural communication.		
Course Outcomes:	**CO1:** Distinguish between different levels of culture **CO2:** Be able to measure culture and cultural differences **CO3 :** Understand the role of culture in various business theories **CO4:** Assess and leverage the impact of culture in management and other business functions **CO5:** Learn to manage cultural differences in applications such as cross-border alliances **CO6:** Is able to employ social and multicultural differences in order to solve problems in his/her professional and social activities.		
Course Outcomes vs. POs Mapping:			

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Courses Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2								2	2		
CO2	1	2	2					1		2		
CO3	1								3		3	
CO4	1			2			3					
CO5	1		2								2	
CO6	1		3									1
Total	7	2	7	2			3	1	5	4	5	1
Average	2.00	2.00	3.50	2.00			3.00	1.00	4.00	3.00	3.33	1.00

Unit – I

Introduction – Concept of Culture for a Business Context; Brief wrap up of organizational culture & its dimensions; Cultural Background of business stakeholders [managers, employees, shareholders, suppliers, customers and others] – An Analytical framework.

Unit – II

Culture and Global Management – Global Business Scenario and Role of Culture. Framework for Analysis; Elements & Processes of Communication across Cultures; Communication Strategy for/ of an Indian MNC and Foreign MNC & High-Performance Winning Teams and Cultures; Culture Implications for Team Building.

Unit – III

Cross Culture – Negotiation & Decision Making – Process of Negotiation and Needed Skills & Knowledge Base – Overview with two illustrations from multicultural contexts [India – Europe/ India – US settings, for instance]; International and Global Business Operations- Strategy Formulation & Implementation; Aligning Strategy, Structure & Culture in an organizational Context.

Unit – IV

Global Human Resources Management – Staffing and Training for Global Operations – Expatriate – Developing a Global Management Cadre.. Motivating and Leading; Developing the values and behaviours necessary to build high-performance organization personnel [individuals and teams included] – Retention strategies.

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Unit – V

Corporate Culture – The Nature of Organizational Cultures Diagnosing the As is Condition; Designing the Strategy for a Culture Change Building; Successful Implementation of Culture Change Phase; Measurement of ongoing Improvement.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Cashby Franklin, Revitalize your corporate culture: PHI, Delhi

2. Deresky Helen, International Management: Managing Across Borders and Cultures, PHI, Delhi

3. Esenn Drlarry, Rchildress John, The Secret of a Winning Culture: PHI, Delhi

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22E1198512 **Open Elective: Rural Innovation projects**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To introduce students with the basic concepts of Rural Development: 2. To get an exposure to a new rural area and the socio-economic condition of people 3. To make aware about rural social institutions, its function and changing nature.		
Course Outcomes:	**CO1:** Analyse the Rural Development Project. **CO2:** Be able to understand Issues in Management of Rural Development Project. **CO3 :** Understand the role of works in promoting and sustaining skills development in rural areas. **CO4:** Analyse the challenges of Panchayati Raj Institutions and their Remedies; **CO5:** Learn to manage cultural differences in applications such as cross-border alliances **CO6:** Able to contribute significantly to employment and economic growth of rural areas		

Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2								2	2		

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CO2	1	2	2					1		2		
CO3	1								3		3	
CO4	1			2			3					
CO5	1		2								2	
CO6	1		3									1
Total	7	2	7	2			3	1	5	4	5	1
Average	2.00	2.00	3.50	2.00			3.00	1.00	4.00	3.00	3.33	1.00

Unit-I

Definition and meaning of Resources, Types of Rural Resources, Natural and Manmade, Characteristics of Resources, Importance of different resources in Rural Development. Rural Governance and Administration in India- Pre & Post independenceElements of Indian constitution Constitutional amendment to Panchayati Raj systemDevelopment (Department) Administration in Rural India.

Unit-II

Land Resources development experience: Classification of land based on utility, Soils – Structure and importance, Properties of Soil- Physical and Chemical, Soil Conservationmethods and importance. Status of Rural Development in the SAARC countries.

Unit-III

Human Resources Dimensions of Rural Development-Quantitative aspects of rural human resource (Gender & Age wide classification, Density, Issue in rural human resources- Scarcity, lack of skill, attitude, and social status). Food security and public distribution system-Rural Financial Sector –Sources of Rural Credit: Institutional and Non Institutional - Service Delivery System in Rural areas, Rural Infrastructural Sector and Millennium Development Goals Housing in Rural Areas.

Unit-IV

Approaches of Rural Development in India- institutional, technological, area and target group, participatory, individualistic. Rural Development Policies during different plan periods.

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Strategies of Rural Development – growth oriented strategy, Welfare strategy, Responsive strategy, Holistic strategy, right-based strategy. PURA Model.

Unit-V

Review of Rural Development Programmes in the area of agricultural sector – crop, noncrop, livestock, fishery, forestry. Review of Rural Development Programmes in area of Social Sectors – Health, Sanitation and Education. Project Planning and Management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit. References:

1. Rural Development: Principles, Policies and Management, Katar Singh, Sage Publications India Pvt. Ltd., 2009.

2. Soil & Water Conservation & Watershed Management Hardcover – 2012, Singh PK Mahnot

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22E1198491 **Information Technology – Lab1 (Spreadsheet and Tally)**

Lab Evaluation:

i) For practical (LAB) subject the distribution shall be 20 marks for internal evaluation and 30 marksfor the semester end examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 20 internal marks. Out of the 20 marks internal, 10 marks shall be for day-today performance (5 marks for day-to-day evaluation and 5marks for Record) and 10 marks shall be evaluated by conducting an internal test towards the end of semester.

ii) ii) Semester End examination shall be conducted by the teacher concerned and external examiner for 30 marks. Three QUESTIONS will be given in the external examination from the experiments based on the syllabus. Each question carries 10 marks. Duration of the examination is 90 minutes

UNIT- 1
Introducing spreadsheet: Choosing the correct tool; Creating and Saving; Spreadsheet workspace; Managing the workspace; Entering and editing data; Data entry; Selecting cells; Saving time when entering data. Presenting a spreadsheet; Number and date/time format tools; Percentages; Dates and Times; Currency; Text; Performing calculations; Basic arithmetic; Using functions; Replicating formulae; Absolute cell addressing; References between worksheets.

UNIT –II
Ranges and functions: Creating named ranges; Using named ranges; Finding and inserting functions; Excel – Functions: what if, Conditional count, sum and average, Multiple criteria with count, sum and if. Time and date calculations.

UNIT- III
Basic of Accounting: Type of Accounts, Rules of Accounting, Principles of concepts and conventions, double entry system, book keeping Mode of Accounting, Financial Statements, Transaction, Recording Transactions. Getting the functional with Tally, Creation and setting up of company in Tally.

UNIT- IV
Accounting Masters in Tally- Features- Configurations- Setting up Account Heads.

UNIT- V
Inventory in Tally- Stock – groups – Stock Categories - Godowns / Location Units of Measure - Stock Items - Creating Inventor y Masters for National Traders

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22E1198492 **Business Communication and Soft skills Lab**

(LAB): Evaluation Process: i) For practical (LAB) subject the distribution shall be 20 marks for internal evaluation and 30 marksfor the semester end examinations. There shall be continuous evaluation by the internal subject teacher during the semester for 20 internal marks. Out of the 20 marks internal, 10 marks shall be for day-today performance (5 marks for day-to-day evaluation and 5marks for Record) and 10 marks shall be evaluated by conducting an internal test towards the end of semester. ii) Semester End examination shall be conducted by the teacher concerned and external examiner for 30 marks. Three QUESTIONS will be given in the external examination from the activities listed in each unit. Each question carries 10 marks. Duration of the examination is 90 minutes.

Unit: 1

Listening and speaking skills- Conversational skills (formal and informal) – group discussion. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on YouTube. (Presenting before the class).

Activities for Unit-1:

1) Dos and Don'ts of Group Discussions.
2) Tell me about yourself.
3) Self SWOT Analysis
4) Analysis of Academic Video clip uploaded on the system for the student.
5) News Presentation- Current affairs.

Unit – II

Organizational Communication: Choosing the organization – goal setting - Time management – – leadership traits – Team work – communicating across teams- designing career and life planning.

Activities for Unit-II:

1) Individual goal setting – process / SMART goals.
2) Designing a team activity to be conducted in the class.
3) Preparing a schedule plan for conducting an event (with proper time management).
4) Designing a self career plan.
5) Prepare a time management chart for your daily schedule. (Prioritization)

Unit – III

Non verbal communication and Body Language: Understanding Body Language Aspects and presenting oneself to an interviewer, Proper handshakes.

Activities for Unit-III:

1) Maintaining the body language for interviews.
2) Presenting oneself to an interviewer.
3) Importance of kinesics in an interview.
4) Role plays on cross cultural communication.

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Unit – IV

Written communication: Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

Activities for Unit-IV:

1) Preparation of effective Resume.

2) Write dialogues for the following situation: Mr. A calls a Hotel in Shimla to make a reservation for four people.

3) Write dialogues for the following situation: Mr.K gives direction to his friend how to reach the JNTUK University.

4) Write a covering letter for job application in TCS.

5) Write at least 5 E-mail etiquette.

Unit- V

Presentation skills: Designing presentations and enhancing presentation skills.

Activities for Unit-V:

1) Prepare a PowerPoint presentation on presentation skills.

2) How to make an effective presentation.

3) Prepare and present a PPT on any topic given by the examiner.

References: 1.Mallika Nawal: "Business Communication", Cengage Learning, New Delhi, 2012.

2.Edwin A. Gerloff, Jerry C. Wofford, Robert Cummins Organisational Communication: The key stone to managerial effectiveness.

3.Meenakshi Rama: "Business Communication", Oxford University Press, NewDelhi

4. C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House, Mumbai

5. Paul Turner: "Organisational Communication", JAICO Publishing House, New Delhi.

6. SathyaSwaroopDebasish, Bhagaban Das" "Business Communication", PHIPrivate Limited, New Delhi, 2009.

7. R.K.Madhukar: "Business Communication", Vikas Publishing House, New Delhi, 2012.

8. Kelly M Quintanilla, Shawn T.Wahl:"Business and Professional Communication", SAGE,New Delhi, 2012.

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I YEAR II SEMESTER

22E1298401 FINANCIAL MANAGEMENT

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To understand the competencies, responsibilities, and tasks performed by financial managers in business organizations. 2. To help future managers in understanding the finances of an organisation and their interface with finance. 3. To explain financial tools and techniques, to help the firms to maximize its value by improving decisions relating to capital budgeting, 4. Application and analysis of dividend decision. 5. To analyse working capital management and cash management techniques.		
Course Outcomes:	**CO1:** Demonstrate the applicability of the concept of Financial Management and their necessities for Managerial Decisions **CO 2.** Analyse a company's performance and make appropriate recommendations regarding its capital structure. **CO3.** Relate how organizations make important investment decisions needs with the practical situations. **CO 4.** Summaries various dividend theories and their impact on effective decision-making. **CO5.** Analyze the working capital requirements and cash problems effecting organizations to deal with more complex financial bottlenecks that arise from them		

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I: Internal Assessment **E**: End Examination **T**: Total Marks

I MBA II SEMESTER

S.No.	Course Code	Course Title	L	M	P	C	I	E	T
1	22E1298401	Financial Management	4	0	0	4	25	75	100
2	22E1298402	Human Resource Management	4	0	0	4	25	75	100
3	22E1298403	Marketing Management	4	0	0	4	25	75	100
4	22E1298404	Operations Management	4	0	0	4	25	75	100
5	22E1298405	Business Research Methods	4	0	0	4	25	75	100
6	OPEN ELECTIVE 22E1298511 22E1298512 22E1298513 22E1298514	 Project Management Technology Management Lean Management Database Management System	4	0	0	4	25	75	100
7	22E1298491	IT-lab 2(Programming R)	0	0	2	2	20	30	50
			24	**-**	**2**	**26**	**170**	**480**	**650**

L: Lecture **M**: Mini Project **P**: Practicals **C**: Credits

I: Internal Assessment **E**: End Examination **T**: Total Marks

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I YEAR II SEMESTER

22E1298401 **FINANCIAL MANAGEMENT**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To understand the competencies, responsibilities, and tasks performed by financial managers in business organizations. 2. To help future managers in understanding the finances of an organisation and their interface with finance. 3. To explain financial tools and techniques, to help the firms to maximize its value by improving decisions relating to capital budgeting, 4. Application and analysis of dividend decision. 5. To analyse working capital management and cash management techniques.		
Course Outcomes:	**CO1:** Demonstrate the applicability of the concept of Financial Management and their necessities for Managerial Decisions **CO 2.** Analyse a company's performance and make appropriate recommendations regarding its capital structure. **CO3.** Relate how organizations make important investment decisions needs with the practical situations. **CO 4.** Summaries various dividend theories and their impact on effective decision-making. **CO5.** Analyze the working capital requirements and cash problems effecting organizations to deal with more complex financial bottlenecks that arise from them		

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	CO 6: Apply financial management concepts and tools to the financing decisions and dividend decisions faced by the firm.

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1		2	2								
CO2	1			3							3	2
CO3	1			2	2							
CO4	1		3								3	
CO5	1		2	2	2							2
CO6	1			3							3	2
Total	6		7	12	4						9	6
Average	1.00		2.33	2.40	2.00						3.00	2.00

UNIT- I

Financial Management: Concept - Nature and Scope - Evolution of financial Management - The new role in the contemporary scenario – Goals and objectives of financial Management - Firm's mission and objectives - Profit maximization Vs. Wealth maximization – Maximization Vs Satisfying - Major decisions of financial manager.

UNIT-II

Financing Decision: Sources of finance - Concept and financial effects of leverage – EBIT – EPS analysis. Cost of Capital: Weighted Average Cost of Capital– Theories of Capital Structure.

UNIT -III

Investment Decision: Concept and Techniques of Time Value of Money – Nature and Significance of Investment Decision – Estimation of Cash flows – Capital Budgeting Process – Techniques of Investment Appraisal – Discounting and Non Discounting Methods.

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UNIT-IV

Dividend Decision: Meaning and Significance – Major forms of dividends – Theories of Dividends – Determinants of Dividend – Dividends Policy and Dividend valuation – Bonus Shares –Stock Splits – Dividend policies of Indian Corporate.

UNIT-V

Liquidity Decision: Meaning - Classification and Significance of Working Capital – Components of Working Capital – Factors determining the Working Capital – Estimating Working Capital requirement – Cash Management Models – Accounts Receivables –Credit Policies – Inventory Management.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit. References:

1. I.M. Pandey: "Financial Management", Vikas Publishers, New Delhi, 2013.

2. Khan and Jain: Financial Management, Tata McGraw Hill, New Delhi,

3. Prasanna Chandra: "Financial Management Theory and Practice", Tata McGrawHill 2011.

4. P.Vijaya Kumar, M.Madana Mohan, G. Syamala Rao: "Financial Management", Himalaya Publishing House, New Delhi, 2013.

5. Brigham,E.F: "Financial Management Theory and Practice", Cengae Learning, New Delhi, 2013

6. RM Srivastava, Financial Management, Himalaya Publishing house, 4 th edition

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22E1298402 **Human Resource Management**

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To introduce the evolution in human resource management and its role in gaining sustainable competitive advantage through people. 2. To develop comprehensive skills in planning, selecting, motivating, and developing the human resources for organizational effectiveness. 3. To discuss theory and practice of compensation, employee benefits, performance development and retention. 4. To explain in detail how to establish pay rates. 5. To understand and apply the concept of industrial relations and the system in which its operates.		
Course Outcomes:	**CO1:** Relate how to strategically plan for the human resources needed to meet organizational goals and objectives. CO2. Compare various methods of HR planning, recruitment, selection, placement and training. CO3. Select and evaluate the right employee performance and compensation systems. CO4. Appraise a job based compensation schemes that is consistent with organization goals .		

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	CO5. Make use of various industrial relationship policies suitable to different situations. **CO 6:** Examine current issues, trends, practices, and processes in HRM.

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1		2	2								
CO2	1			3							3	2
CO3	1			2	2							
CO4	1		3								3	
CO5	1		2	2	2							2
CO6	1			3							3	2
Total	6		7	12	4						9	6
Average	1.00		2.33	2.40	2.00						3.00	2.00

UNIT -I

HRM: Significance - Definition and Functions – evolution of HRM- Principles - Ethical Aspects of HRM- - HR policies, Strategies to increase firm performance - Role and position of HR department –aligning HR strategy with organizational strategy - HRM –changing , global perspective challenges, environment – crosscultural problems – emerging trends in HRM.

UNIT -II

Investment perspectives of HRM: HR Planning – Demand and Supply forecasting - Recruitment and Selection- Sources of recruitment - Tests and Interview Techniques - Training and Development – Methods and techniques– Job design , evaluation and Analysis - Management development - HRD concepts.

UNIT –III

Performance Appraisal: Importance – Methods – Traditional and Modern methods – Latest trends in performance appraisal - Career Development and Counseling- Compensation -

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Concepts and Principles Influencing Factors- Current Trends in Compensation- Methods of Payments in detail - Incentives rewards compensation mechanisms.

UNIT -IV

Wage and Salary Administration: Concept- Wage Structure- Wage and Salary Policies- Legal Frame WorkDeterminants of Payment of Wages- Wage Differentials - Incentive Payment Systems. Welfare management: Nature and concepts – statutory and non-statutory welfare measures.

UNIT -V

Managing Industrial Relations: Trade Unions - Employee Participation Schemes-Collective Bargaining– Grievances and disputes resolution mechanisms – Safety at work – nature and importance – work hazards – safety mechanisms - Managing work place stress.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013. 2. N.Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai.

3. Mathis, Jackson,Tripathy:"Human Resource Management: A south-Asin Perspective", Cengage Learning, New Delhi, 2013.

4. Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.

5. MadhurimaLall, Sakina QasimZasidi: "Human Resource Management", Excel Books, New Delhi, 2010.

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22E1298403 MARKETING MANAGEMENT			
Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To provide an opportunity for analyzing the concepts and evolution of marketing. 2. To create an awareness on the various aspects relating to segmentation, target market and positioning strategy 3. To familiarize with the basic terms, concepts, approaches and problems of pricing decisions. 4. To understand marketing communications concepts and develop a promotional plan. 5. To understand organization of marketing management and its management.		
Course Outcomes:	**CO1:** Match the role and functions of marketing and utilise information of a firm's external and internal marketing environment to identify and prioritise appropriate marketing strategies. **CO2:** Make use of the key analytical frameworks and tools used in marketing in relation to segmenting and targeting of products. **CO3:** Understand tactical marketing issues and strategies related to pricing of products and services. **CO4:** Communicate marketing information persuasively and accurately in oral, written and graphical format as per the need.		

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	CO5: Understand evolution, organizing implementation controlling and efficiency measurement of marketing management. **CO6:** Know the consumer behavior and their decision making process

Courses Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2						1		1		1
CO2	1	1		1				1	2	2		
CO3	1		2					1	1	1	2	
CO4	1	1		1			1	1	2			
CO5	1			1		2				1		
CO6	1		2					1			1	1
Total	7	4	4	3		2	1	5	5	5	3	2
Average	1.17	1.33	2.00	1.00		2.00	1.00	1.00	1.67	1.25	1.50	1.00

UNIT –I

Introduction to Marketing: Needs - Wants – Demands - Products - Exchange - Transactions - Concept of Market and Marketing and Marketing Mix - Production Concept- Product Concept - Sales and Marketing Concept - Societal Marketing Concept - Green Marketing concept - Indian Marketing Environment.

Unit-II

Market Segmentation, Targeting and Positioning: Identification of Market Segments - Consumer and Institutional/corporate Clientele - Segmenting Consumer Markets - Segmentation Basis – Evaluation and Selection of Target Markets – Positioning significance - Developing and Communicating a Positioning Strategy.

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Unit – III

Product and Pricing Aspects: Product – Product Mix - Product Life cycle Obsolescence- Pricing- Objectives of Pricing - Methods of Pricing - Selecting the Final price - Adopting price - Initiating the price cuts – Imitating price increases-Responding to Competitor's price changes.

Unit – IV

Marketing Communication: Communication Process – Communication Mix – Integrated Marketing Communication - Managing Advertising Sales Promotion - Public relations and Direct Marketing - Sales force – Determining the Sales Force Size - Sales force Compensation

Unit – V

Distribution, Marketing Organization and Control: Channels of Distribution-Intensive, Selective and Exclusive Distribution- Organizing the Marketing Department - Marketing Implementation - Control of Marketing Performance - Annual Plan Control - Profitability Control - Efficiency Control - Strategic Control.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

Phillip Kotler: "Marketing Management ", Pearson Publishers, New Delhi, 2013.

Rajan Saxena: "Marketing Management", Tata McGraw Hill, New Delhi, 2012.

VS Ramaswamy & S Namakumari, Marketing Management Global Perspective Indian Context 4th Edition, Mac Millan Publishers 2009.

Tapan K Panda: "Marketing Management", Excel Books, New Delhi, 2012

Paul Baines, Chris Fill, Kelly Page Adapted by Sinha K: "Marketing", Oxford University Press, Chennai, 2013

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22E1298404 Operations Management

Lecture :	4 hrs./week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To provide an introduction to the functional area of production and operations management as practiced in manufacturing industries and the services sector. 2. To equip the students with the knowledge of production layout and Optimal Production Strategies 3. To familiarize the students about the use of control charts 4. Better understanding of quality management. 5. Plan and implement suitable materials handling principles and practices in the operations		
Course Outcomes:	**CO1:** To list an overall view of the decision-making process as it relates to the major areas of Production/ Operations Management. **CO2:** To Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments		

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	CO3: To provide a basis for current decision on acceptances or rejections in manufacturing or purchasing using various control charts **CO4:** To Plan and implement suitable quality control measures in production. CO5: To understand the Materials Management function starting from Demand Management through Inventory Management. CO6: Able to Plan and implement suitable quality control measures in Quality Circles to TQM.

Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	2	2			1			1		1		1
CO2	1	1		1				1	2	2	1	
CO3	1		2		2			1	1	1	2	
CO4	2	1		1	1		1	1	2			
CO5	1			1		2				1		
CO6	1		2					1			1	
Total	8	4	4	3	4	2	1	5	5	5	4	1
Average	1.33	1.33	2.00	1.00	1.33	2.00	1.00	1.00	1.67	1.25	1.33	1.00

UNIT-I:

Introduction to Operation Management: Nature & Scope of Operation/ Production Management, Relationship with other functional areas, Recent trend in Operation Management,

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Manufacturing & Theory of Constraint, Types of Production System, Just in Time (JIT) & lean system.

UNIT -II:

Product Design & Process Selection: Stages in Product Design process, Value Analysis, Facility location & Layout: Types, Characteristics, Advantages and Disadvantages, Work measurement, Job design.

UNIT- III:

Forecasting & Capacity Planning: Methods of Forecasting, Overview of Operation Planning, Aggregate Production Planning, Production strategies, Capacity Requirement Planning, MRP, Scheduling, Supply Chain Management, Purchase Management, Inventory Management.

Unit- IV:

Productivity: Factors, Affecting Productivity – Job Design – Process Flow Charts – Methods Study – Work Measurement – Engineering and Behavioral Approaches.

UNIT -V:

Quality Management: Quality- Definition, Dimension, Cost of Quality, Quality Circles-Continuous improvement (Kaizen), ISO (9000&14000 Series), Statistical Quality Control: Variable & Attribute, Process Control, Control Charts -Acceptance Sampling Operating Characteristic Curve (AQL , LTPD, Alpha & Beta risk), Total Quality Management (TQM).

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Krajewski & Ritzman (2004). Operation Management -Strategy and Analysis. Prentice Hall of India.

2. Panner Selvem, Production and Operation Management, Prentice Hall of India.

3. Chunnawals, Production & Operation Management Himalaya, Mumbai

4. Charry, S.N (2005). Production and Operation Management- Concepts, Methods Strategy. John Willy & Sons Asia Pvt Limited.

5. K Aswathappa & Sridhar Bhatt, Production & Operations Management, Himalaya, Mumbai.

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22E1298405 Business Research Methods

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To provide an understanding of different aspects associated with the research process relating to management, business and the social sciences. 2. To develop an understanding of various research designs and sampling techniques. 3. To organize and conduct research in a more appropriate manner through survey research and analyzing the data. 4. Have a basic awareness of hypothesis formulation and data analysis through statistical inference. 5. To familiarize the students with statistical techniques such as multi-variate, bi-variate t- test, z -test and ANOVA		
Course Outcomes:	**CO1:** Have basic awareness of social research, research process and testing of hypothesis. **CO2:** Have adequate knowledge on research designs and measurement scaling techniques as well as quantitative data analysis. **CO3:** Apply various methodologies including sampling questioning, empirical techniques in their research work reports. **CO4** :Construct the data for hypothesis testing and statistical quality control charts		

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	CO5: Construct the data using various multi-variate and bi-variate techniques and ANOVA for complex experimental designs. **CO6:** Be able to write & develop independent thinking for critically analyzing research reports.

Course Outcomes vs. POs Mapping:

Courses Outcomes	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	1	1		1					2		1	1
CO3	1		2		2				1		2	1
CO4	2	1		1	1		1		1	1		1
CO5	1			1		2						1
CO6	1							1			1	1
Total	8	3	2	3	4	2	1	1	4	1	4	6
Average	1.33	1.00	2.00	1.00	1.33	2.00	1.00	1.00	1.33	1.00	1.33	1.00

UNIT -I

Introduction : Nature and Importance of Research, The role of Business Research, Aims of social research, Types of Research- Pure research vs. Applied research, Qualitative research vs. Quantitative research, Exploratory research, Descriptive research and Experimental research, ethical issues in business research- Defining Research Problem, Steps in Research process.

UNIT -II

Data Base: Discussion on primary data and secondary data, tools and techniques of collecting data. Methods of collecting data. Sampling design and sampling procedures. Random vs. Non-random sampling techniques, determination of sample size and an appropriate sampling design. Designing of Questionnaire –Measurement and Scaling – Nominal Scale – Ordinal Scale – Interval Scale – Ratio Scale – Guttmann Scale – Likert Scale – Schematic Differential Scale.

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UNIT -III

Survey Research and data analysis: Selection of an appropriate survey research design, the nature of field work and Field work management. Media used to communicate with Respondents, Personal Interviews, Telephone interviews, Self-administered Questionnaires-Editing – Coding – Classification of Data – Tables and Graphic Presentation –Preparation and Presentation of Research Report.

UNIT –IV

Statistical Inference: Formulation of Hypothesis –Tests of Hypothesis - Introduction to Null hypothesis vs. alternative hypothesis, parametric vs. non-parametric tests, procedure for testing of hypothesis, tests of significance for small samples, application, t-test, Chi Square test.

UNIT -V

Multivariate Analysis: Nature of multivariate analysis, classifying multivariate techniques, analysis of dependence, analysis of interdependence. Bi-Variate analysis-tests of differences-t test for comparing two means and z-test for comparing two proportions and ANOVA for complex experimental designs.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References

1. C.R. Kothari: Research Methodology, methods and Techniques New Age International Publisher.

2. Navdeep and Guptha : "Statistical Techniques & Research Methodology", Kalyani Publishers

3. Willam G.Zikmund, Adhkari: "Business Research Methods", Cengage Learning, New Delhi, 2013.

4. A.N. Sadhu, Amarjit singh, Research methodology in social sciences, 7th Edition Himalaya Publications.

5. A Bhujanga rao , Research methodology, Excel Books, 2008.

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22E1298511 Open Elective : Project Management

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. Applies the PM processes to initiate, plan, execute, monitor and control, and close projects and to coordinate all the elements of the project 2. Manages projects effectively including the management of scope, time, costs, and quality, ensuring satisfying the needs for which the project was undertaken 3. Applies processes required to manage the procurement of a project, including acquiring goods and services from outside the organization 4. Manages project risk, including identifying, analyzing and responding to risk 5. Analyzes and manages stakeholder expectations and engagement to ensure a successful project outcome		
Course Outcomes:	**CO1:** Strategically applies project management practices in a variety of organizational and international settings. **CO2:** Following this course, students will be able to describe a project life cycle, and can skillfully map each stage in the cycle **CO3:** Students will identify the resources needed for each stage, including involved stakeholders, tools and supplementary materials		

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CO4 :Students will describe the time needed to successfully complete a project, considering factors such as task dependencies and task lengths

CO5: Students will be able to provide internal stakeholders with information regarding project costs by considering factors such as estimated cost, variances and profits

CO6: Students will be able to develop a project scope while considering factors such as customer requirements and internal/external goals

Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1	1			1							1
CO2	1	1		1					1		1	1
CO3	1		2		2				1		2	1
CO4	1	1		1	1		1		1	1	1	1
CO5	1					2						1
CO6	1							1			1	1
Total	6	3	2	2	4	2	1	1	3	1	5	6
Average	1.00	1.00	2.00	1.00	1.33	2.00	1.00	1.00	1.00	1.00	1.25	1.00

Unit -I:

Basics of Project Management –Concept– Project environment – Types of Projects – Project life cycle – Project proposals – Monitoring project progress – Project appraisal and Project selection – Causes of delay in Project commissioning– Remedies to avoid overruns.

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Identification of Investment opportunities – Sources of new project ideas, preliminary screening of projects – Components for project feasibility studies.

Unit- II:

Market feasibility -Market survey – Categories of Market survey – steps involved in conducting market survey – Demand forecasting techniques, sales projections.

Unit- III:

Technical and Legal feasibility: Production technology, materials and inputs, plant capacity, site selection, plant layout, Managerial Feasibility Project organization and responsibilities. Legalities – Basic legal provisions. Development of Programme Evaluation & Review Technique (PERT) –Construction of PERT (Project duration and valuation, slack and critical activities, critical path interpretation) – Critical Path Method (CPM)

Unit- IV:

Financial feasibility – Capital Expenditure – Criteria and Investment strategies – Capital Investment Appraisal Techniques (Non DCF and DCF) – Risk analysis – Cost and financial feasibility – Cost of project and means of financing — Estimation of cash flows – Estimation of Capital costs and operating costs; Revenue estimation – Income – Determinants – Forecasting income –Operational feasibility - Breakeven point – Economics of working.

Unit -V:

Project Implementation and Review: Forms of project organization – project planning – project control – human aspects of project management – prerequisites for successful project implementation – project review – performance evaluation – abandonment analysis.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Prasanna Chandra, "Projects, Planning, Analysis, Selection, Financing, Implementation and Review", Tata McGraw Hill Company Pvt. Ltd., New Delhi 1998.

2. Gido: Effective Project Management, 2e, Thomson, 2007.

3. Singh M.K, "Project Evaluation and Management".

4. Vasanth Desai, Project Management, 4th edition, Himalaya Publications 2018.

5. Clifford F. Gray, Erik W. Larson, "Project Management, the Managerial Emphasis", McGraw Hill, 2000.

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22E1298512 Open Elective: Lean Management

Lecture :	4 hrs/week	**Internal Assessment:**	25
Mini Project :		**Final Examination:**	75
Practical :	-	**Credits:**	4
COURSE OBJECTIVES	1. To understand lean management principles & provides an understanding of factors that contribute to organizational wastes, examining ways to eliminate wastes, & developing & implementing an improved organizational processes, for significant impact to the company's bottom line. 2. To understand how lean management today represents a profound change in the competitive business culture and a leading indicator of excellence in the organization. 3. To understand how lean management principles is developed from Toyota Production System(TPS) 4. Developing an understanding of basic principles of lean management strategy, in POM (production & operations management) & supply chain management. 5. To understand how by implementing lean management organizations can improve product & processes without adding any more money, people, equipment, inventory or space and aim for perfection.		

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Course Outcomes:	**CO1:** To understand issues & challenges in implementing & developing lean manufacturing techniques from TPS & its contribution for improving organizational performance. **CO2:** Apply lean techniques to bring competitive business culture for improving organization performance **CO3:** Analyze how lean techniques can be applied to manufacturing & service industry **CO4:** Developing lean management strategy for Supply chain management **CO5:** Analyzing how lean technique can create value generation for organization. **CO6:** Apply appropriate approaches to project using Lean tools and techniques.

Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
2	2			1			1		1		1	2
1	1		1				1	2	2	1		1
1		2		2			1	1	1	2		1
2	1		1	1		1	1	2				2
1			1		2				1			1
1		2					1			1		1

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8	4	4	3	4	2	1	5	5	5	4	1	8
1.33	1.33	2.00	1.00	1.33	2.00	1.00	1.00	1.67	1.25	1.33	1.00	1.33

Unit- I

Introduction: Mass production system, Craft Production, Origin of Lean production system , Why Lean production , Lean revolution in Toyota , Systems and systems thinking , Basic image of lean production , Customer focus , Waste Management.

UNIT- II

Just In Time: Why JIT , Basic Principles of JIT, JIT system, Kanban, Six Kanban rules, Expanded role of conveyance, Production leveling, Three types of Pull systems, Value stream mapping. JIDOKA, Development of Jidoka concept, Why Jidoka, Poka, Yoke systems, Inspection systems and zone control – Types and use of Poka-Yoke systems, Implementation of Jidoka

UNIT -III

Kaizen: Six – Sigma philosophy and Methodologies ,QFD, FMEA Robust Design concepts; SPC, QC circles standardized work in lean system , Standards in the lean system, 5S system.

UNIT- IV

Total Productive Maintenance: Why Standardized work, Elements of standardized work, Charts to define standardized work, Kaizen and Standardized work Common layouts.

UNIT- V

Hoshin Planning & Lean Culture: Involvement, Activities supporting involvement, Quality circle activity, Kaizen training, Key factors of PKT success, Hoshin Planning System, Four Phases of Hoshin Planning, Why Lean culture – How lean culture feels.

Relevant cases have to be discussed in each unit and in examination case is compulsory from any unit.

References:

1. Jeffrey Liker, The Toyota Way: Fourteen Management Principles from the World's Greatest Manufacturer, McGraw Hill, 2004.

2. Debashish Sarkar , Lessons in Lean Management,

3. Dale H., Besterfield , Carol, Besterfield, etal, Total Quality Management (TQM) 5e by Pearson 2018.

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22E1298491 IT Lab 2 (Programming R)

Lecture :	-	**Internal Assessment:**	20
Mini Project :	-	**Final Examination:**	30
Practical :	2 hrs/week	**Credits:**	4
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.		
Course Outcomes:	**CO1:**Access online resources for R and import new function packages into the R workspace **CO2:**Import, review, manipulate and summarize data-sets in R **CO3:**Explore data-sets to create testable hypotheses and identify appropriate statistical tests **CO4** :Perform appropriate statistical tests using R **CO5:** Create and edit visualizations CO6: Apply various concepts to write programs in R		

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Course Outcomes vs. POs Mapping:

Courses Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	1	1	1		1							
CO2	1	1		2					1		1	
CO3	1	1	2	1	2				1		2	
CO4	1	1	2	1	1		1		1	1	1	
CO5	1	2		1		2						
CO6	1	1	1					1			1	1
Total	6	7	6	5	4	2	1	1	3	1	5	1
Average	1.00	1.17	1.50	1.25	1.33	2.00	1.00	1.00	1.00	1.00	1.25	1.00

UNIT-I:

All the theory content here below shall be executed with examples. Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II:

All the theory content here below shall be executed with examples. R Programming Structures, Control Statements, Loops, - Looping Over Non vector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT-III:

All the theory content here below shall be executed with examples. Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear

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Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files,

UNIT-IV:

All the theory content here below shall be executed with examples. Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function –Customizing Graphs, Saving Graphs to Files.

UNIT-V:

All the theory content here below shall be executed with examples. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.

Note: From all the theory content above three examples from each unit has to be taken as lab exercises. Out of all the 15 programs, the lab exam has to be conducted.

REFERENCE BOOKS:

1) The Art of R Programming, Norman Matloff, Cengage Learning

2) R for Everyone, Lander, Pearson

3) R Cookbook, PaulTeetor, Oreilly

4) R Programming By Dr.T. Murali Mohan , S.Chand Publications.

5) Garrett Grolemund, Hands on Programming with R, Oreilly

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