

Departments	Open Elective 1		Open Elective 2		Open Elective 3	
	Subject Code	Name of the Subject	Subject Code	Name of the Subject	Subject Code	Name of the Subject
CIVIL ENGINEERING	21CE3161	Disaster Management	21CE3263	Remote Sensing & GIS	21CE4165	Road safety Engineering
	21CE3162	Building Materials and Technologies	21CE3264	Environmental Pollution	21CE4166	Environmental Impact Assessment
ELECTRICAL AND ELECTRONICS ENGINEERING	21EE3161	Renewable Energy Systems	21EE3261	Electrical Energy Conservation and Auditing	21EE4161	Electric and Hybrid Vehicles
	21EE3162	Electrical Engineering Materials	21EE3262	Reliability Engineering	21EE4162	Energy Storage Systems
MECHNAICAL ENGINEERING	21ME3161	Fundamentals of Mechanical Engineering	21ME3261	Fundamentals of Rapid Prototyping	21ME4161	Total Quality Management
	21ME3162	Fundamentals of Manufacturing Processes	21ME3262	Quantitative Analysis for business decisions	21ME4162	Fundamentals of Robotics
ELECTRONICS AND COMMUNUCATION ENGINEERING	21EC3161	Principles of Electronic Communications	21EC4161	Microprocessors and Microcontrollers	21EC4261	Embedded System Design
	21EC3162	Digital Systems	21EC4162	Basic principles of VLSI DESIGN	21EC4262	Electronic Measuring Instruments
COMPUTER SCIENCE ENGINEERING	21CS3161	Fundamentals of Software Engineering	21CS3263	IoT Essentials for Application Development	21CS4165	Introduction to Artificial Intelligence
	21CS3162	Introduction to Data Analytics	21CS3264	Cloud Computing and its Applications	21CS4166	Ethical Hacking
INFORMATION TECHNOLOGY	21IT3161	Essentials of Digital Transformation	21IT3261	Mobile Application Development	21IT4161	Fundamentals of Information Security
	21IT3162	Fundamentals of Database Systems	21IT3262	Web Development	21IT4162	Fundamentals of Computer Networks

COMPUTER SCIENCE AND BUSINESS SYSTEM (CSBS)	21BU3161	Fundamental of Management and Organizational Behavior	21BU3261	Financial Modeling	21BU4161	Marketing Management and Research
	21BU3162	Business Law and Ethics	21BU3262	Block chain Technology	21BU4162	Cloud Computing
COMPUTER SCIENCE AND ENGINEERING (CYBER SECURITY)	21CY3161	Introduction to Cyber Security	21CY3263	Introduction to Ethical Hacking	21CY4161	Social Media Security Essentials
	21CY3162	Cyber Laws-IT Act 2000	21CY3264	Introduction to Digital Forensics	21CY4162	Fundamentals of Security Incident & Response Management
COMPUTER SCIENCE AND ENGINEERING (AIML)	21AM3161	Machine Learning	21AM3261	Neural Networks & Deep Learning	21AM4161	Soft Computing
	21AM3162	Artificial Intelligence	21AM3262	Reinforcement Learning	21AM4162	Natural Language Processing
COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)	21DS3161	Data Science For Beginners	21DS3263	Knowledge Discovery Techniques	21DS4165	Social Media Analytics
	21DS3162	R Programming	21DS3264	Data Guided Methods	21DS4166	Data Visualization Using Python

21CE3161: DISASTER MANAGEMENT
(Open Elective-I)

B.Tech III Year I Semester

L	T	P	C
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Course Objectives:

- To increase the knowledge and understanding basic concepts of Disasters and Hazards
- To impart the knowledge of types of Disasters and vulnerable profile of India
- To infer capacity building concepts and planning of disaster management.
- To interpret the strategies, policies and coping capacities in order to lessen the impact of hazards.
- To demonstrate the role of Government Agencies in disaster planning and policies

Course outcomes:

After learning the contents of this paper the student must be able to

- Understanding Disasters, man-made Hazards and Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts and planning of disaster managements
- Understanding coping strategies and alternative adjustment processes
- Understanding role of government agencies in disaster planning and policies

UNIT - I: Understanding Disaster

Concept of Disaster, Environmental Disasters and Environmental Stress- Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards, epidemics and pandemics

UNIT - II: Disaster Management Mechanism

Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III: Capacity Building

Capacity Building Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management

UNIT - IV: Coping with Disaster

Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

UNIT - V: Planning for disaster management

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster Management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans, Legislative Support at the state and national levels.

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (<http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf>)

21CE3162: BUILDING MATERIALS AND TECHNOLOGIES
(Open Elective-I)

B.Tech III Year I Semester

L	T	P	C
3	-	-	3

Course Objectives: The objectives of the course is

- To understand various building materials
- To opherhend knowledge on foundation and masonry
- To study about lintels, arches, roofs and roofs
- To compared knowledge on energy and environmental issues of building materials
- To learn about various building technology

Course Outcomes: After the completion of the course student should be able to

- Define the Basic terminology that is used in the industry
- Categorize different building materials, properties and their uses
- Select the different type's lintels and roofs and floors in industry construction
- Understand the Prevention of damage measures and good workmanship
- Explain different building techniques in industry construction

UNIT I

Building Materials: Stone: as building material, Requirements of good quality stones, dressing of stones, deterioration and prevention of stone work. **Bricks:** Classification, Manufacturing, Requirements of good bricks, Field and laboratory tests on bricks, compressive strength, water absorption, efflorescence, dimension and warpage; cement concrete blocks, stabilized mud blocks, sizes, requirements of good blocks; **Mortar:** Types and requirements; **Timber:** wood, structure, types and properties, seasoning, defects: alternate materials for timber.

UNIT II

Foundation: Investigation of soil, Safe bearing capacity of soil, Functions and requirements of good foundation, types of foundation.

Masonry: Definition and terms used in masonry, Brick masonry, characteristics and requirements of good brick masonry, bonds in brick work; Stone masonry: requirements of good stone masonry, classification, characteristics of different stone masonry, joints in stone masonry; Walls, types of walls, cavity walls.

UNIT-III

Lintels and Arches: Definition, function and classification of lintels, Balconies, Chejja and Canopy; Arches: Elements, types and stability of an arch.

Floors and Roofs: Floors: Requirements of good floor, components of ground floor, selection of floor material, laying of concrete, Mosaic, Marble, Granite, Tile flooring, cladding of tiles. Roof: requirements of good roof, elements of a pitched roof, Trussed roof, King post Truss, Queen post truss, Different roofing material, RCC roof.

UNIT IV

Introduction Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry, Environmental friendly and cost effective building technologies, Requirements for building of different climatic regions, Traditional building methods and vernacular architecture.

UNIT V

Building Technologies: Wall construction, Types, Construction method ,Masonry mortars, Types, Preparation, Properties, Ferro cement and ferro concrete building components, Materials and specifications, Properties, Construction methods, Applications , roofing systems, Concepts, Filler slabs,Composite beam panel roofs, Masonry vaults and domes

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
4. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

21CE3263: REMOTE SENSING & GIS
(Open Elective-II)

B.Tech III Year II Semester

L	T	P	C
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Course Objectives:

- An opportunity to the students to study modern ground, space and air based surveying techniques.
- To prepare the students to analyse the photographs, images, data, attribute data and know about different types of satellite and its sensors of remote sensing.
- Know the concepts of Geographic Information System (GIS) and coordinate systems used in preparation of different Maps.
- To make the students to analyse the different ground features using vector model.
- Enable the students to know how the features are identified in the cell using raster model

Course Outcomes: After the completion of the course student should be able to

- Analyze aerial photographs.
- Explain electromagnetic spectrum, basic concepts and process of remote sensing.
- Analyze and understand the geographic coordinate system
- Analyze and interpret data using vector data model.
- Analyze and interpret data using raster data model.

UNIT - I

Introduction to Photogrammetry: Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, Fiducial points, parallax measurement using fiducial line.

UNIT - II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters commonly used Map Projections - Projected coordinate Systems.

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules.

UNIT - V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
2. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell,Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.
4. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
5. Text Book of Remote Sensing and Geographical Information Systems by M. Anji Reddy – 4th Edition B.S.Publications

21CE3264: ENVIRONMENTAL POLLUTION
(Open Elective-II)

B.Tech III Year II Semester

L	T	P	C
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Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the various environmental issues

Course Outcomes: At the end of the course, the student able to

- Define the importance of ecological balance and bio diversity
- Suggest natural resources & bio diversity for sustainable life style
- Identify various environmental pollutants and their effects
- Suggest various management methods
- Identify various causes of environmental issues

UNIT - I

Multi disciplinary Nature of Environment : -Introduction , objectives, scope and importance , science of environment, Need of Public awareness , world environment Day , Environmental Protection

Chemistry of environmental pollutants Definition of pollution; pollutants; classification of pollutants; solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring pollutants, concept of biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants

UNIT - II

Natural resources- Renewable and non-renewable Resources –Forest Resources,Water resources, mineral resources, Food resources energy resources, energy resources,land resources, ,Equitable use of resources for sustainable life style

Ecosystem and biodiversity - Natural and Artificial ecosystems –impacts of Human on Ecosystems ,biodiversity , Biological classification of India , threats of biodiversity endangered and endemic species of India ., value of biodiversity, India as a mega-diversity nation , Biodiversity at global , national and local level

UNIT – III

Environmental pollution and management – sources ,effects on environment and Humans , types of environmental pollution, Role of an individual in prevention of Pollution , sources of surface and ground water pollution , Eutrophication , effect of water contaminants on human health , marine pollution –sources, oil spills ,coral reefs and their demise , existing challenges and management

Management and Effects - Floods, earthquake ,cyclone ,landslides ,Tsunami

UNIT – IV

Social issues and the environment - unsustainable to sustainable Development –case studies, urban problems related to energy –Definition, Need , Barriers , promoting of energy conservation , water conservation and management – water conservation , Rain water Harvesting , Water shed management –case study , Population Explosion

Environmental protection laws in India – water, air, wildlife protection ,Indian forest , environment protection act , Issues involves in enforcement of environmental Legislation

UNIT - V

Environmental Issues: Definition, need and objectives of environmental protection. – issues and effects of environmental problems –Automobile pollution, soil degradation, Global warming, over population, Natural Resources Depletion, waste Disposal , leachate formation ,Loss of biodiversity , climate change , Ocean Acidification, Nitrogen cycle ,, acid rains, over fishing ,Public Health issues, Urban sprawl.

TEXT BOOKS:

1. Environmental Science And Engineering by Dr.Suresh K.Dhameja S.K,Kataria Sons , third Edition :2006-2007
2. Text book of Environmental Studies by Erach Bhaurach , University Grants commission , University Press

REFERENCES :

1. Text bo ok of Environmental Science –Dr. Anji Reddy 2007, BS Publications
2. Introduction to Environmental Science by Y.Anjaneyulu BS Publications
3. Environmental science :toward a Sustainable Future by Richard T.Wright.2008 PHL Learning Privated Ltd.New Delhi

21CE4165: ROAD SAFETY ENGINEERING
(Open Elective-III)

B.Tech IV Year I Semester

L	T	P	C
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Course Objects: To learn

- The fundamental of traffic Engg. & some of the statistics methods to analysis the traffic safety.
- The accident interrogations risk involved with measures to identity the causes are dealt.
- The role of road safety in planning the urban infrastructures design is discussed.
- The various traffic management systems for safety & safety improvement strategies are dealt.

Course Outcomes: By the end of this course, Students should be able to

- Understand fundamental of Traffic Engg.
- Investigate & determine the collective factors & remedies of accident involved.
- Design & planning various road geometrics.
- Massage the traffic system from road safety point of view.
- Know various traffic management systems

UNIT I:

Fundamentals of Traffic Engineering - Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Traffic Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis – Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II:

Accident Investigations and Risk Management, Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction

UNIT III:

Road Safety in Planning And Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipment's, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care

UNIT IV:

Role of Urban infrastructure design in safety: Geometric Design of Roads; Design of Horizontal and Vertical Elements, Junctions, At Grade and Grade Separated Intersections, Road Safety in Urban Transport, Sustainable Modes and their Safety.

UNIT V:

Traffic Management Systems for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

Text Books:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.
3. Transportation Engineering – An Introduction, C. Jotin khisty, B. Kent Lall

References

1. Fundamentals of Traffic Engineering, Richardo G Sigua
2. Handbook of Road Safety measures, second Edition, Rune Elvik, Alena Hoye, Truls Vaa, Michael Sorenson
3. Road Safety by NCHRP

21CE4166: ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective-III)

B.Tech. IV Year I Sem

L	T	P	C
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Course Objectives: To

- Understand the basic terminologies of EIA and methodologies of EIA.
- Understand the assessment of deforestation and its impact predictions.
- Explain assessment of soil quality and its impact prediction.
- Understand environment Audits and its methods.
- Understand various Acts and case studies.

Course Outcomes: At the end of the course, the student will be able to

- Discuss the objectives of EIA studies and identify the methodologies to prepare EIA.
- Identify and incorporate mitigation measures of deforestation.
- Identify and incorporate mitigation measures of soil quality.
- Execute Audit report.
- Apply various environmental acts in the preparation of case study reports.

UNIT – I

Basic concept of EIA: Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A method, Ad-hoc method, matrix method, Network method and overlay method.

UNIT- II

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT- III

Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.

UNIT – IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

UNIT – V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries-Water resource projects, sewage treatments plant, municipal solid waste processing plant, thermal plant and airport.

TEXT BOOKS:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications

REFERENCES:

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers-Rutledge, London, 1992.

21EE3161	III Year I Sem	Renewable Energy Systems	3L:0T:0P	3 Credits
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Pre-requisites: None

Course Objectives:

- To study the concepts of Wind Energy Conversion Systems.
- To study and understand wind generation topologies.
To know the concepts of Solar Thermal Power Generation.
- To study the characteristics of photo voltaic cells.
- To study the concepts of renewable energy systems other than solar and wind power generations.

Course Outcomes: At the end of the course the student will be able to:

- Discuss the energy scenario from wind energy conversion system.
- Analyze Wind Generator Topologies.
- Discuss the solar resources & solar thermal power generation.
- Analyze the characteristics of photo voltaic systems.
- Differentiate the concepts of renewable power generations excluding solar and wind.

UNIT – I

Wind Energy: Introduction to Wind energy, Site selection consideration, Basic component of Wind Energy Conversion Systems (WECS) ; Classification of Wind Energy Conversion system- Horizontal axis & Vertical axis; Advantages & Disadvantages of wind energy conversion system

UNIT – II

Wind Generator Topologies: Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators,

UNIT - III

Solar Thermal Power Generation: Introduction, solar radiation- Beam & Diffuse radiation, solar geometry, Earth Sun angles, observer Sun angles, solar day length, focusing type

Solar Collector - Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond.

UNIT – IV

Solar Photovoltaic: Basic Principle of solar photovoltaic conversion, Types of Solar Cells -Amorphous, Mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, Maximum Power Point Tracking (MPPT) algorithms.

UNIT – V

Other Renewable Energy Sources: Energy from Bio mass: conversion processes, Geothermal Power Plant: Dry Steam System, Flash Steam System, Binary Cycle System; MHD Generation, Ocean Thermal Energy Conversion (OTEC), Energy from the tides

TEXT BOOKS:

1. G. D. Rai, “Non-Conventional Energy Sources”, Khanna Publishers, 2011.
2. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
3. G. M. Masters, “Renewable and Efficient Electric Power Systems”, John Wiley and Sons, 2004.

REFERENCE BOOKS:

1. D.P.Kothari, K.C Singal, Rakesh Ranjan “Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt.Ltd, New Delhi, 2013.
2. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGrawHill, 1984.
3. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley and Sons Ltd., 2006.

21EE3162	III Year I Sem	Electrical Engineering Materials	3L:0T:0P	3Credits
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Prerequisite: Engineering chemistry and Engineering Physics - II

Course Objective:

- To understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.

Course Outcomes: After completion of this course, the student will be able to

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semiconductor materials and technologies.
- Acquire Knowledge on Materials used in electrical engineering and applications.

UNIT- I Dielectric Materials:

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT – II Magnetic Materials:

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis

UNIT – III Semiconductor Materials:

Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI)

UNIT – IV Materials for Electrical Applications:

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetal fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT – V Special Purpose Materials:

Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI

Text Books:

1. “R K Rajput”, “ A course in Electrical Engineering Materials”, Laxmi Publications, 2009
2. “T K Basak”, “ A course in Electrical Engineering Materials”, New Age Science Publications 2009

Reference Books:

1. TTTI Madras, “Electrical Engineering Materials”, McGraw Hill Education, 2004.
2. “AdrianusJ.Dekker”, Electrical Engineering Materials, PHI Publication, 2006.
3. S. P. Seth, P. V. Gupta “A course in Electrical Engineering Materials”, Dhanpat Rai & Sons, 2011.

21EE3261	III Year II Sem	Electrical Energy Conservation and Auditing	3L:0T:0P	3 Credits
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Course Outcomes:

At the end of this course students will demonstrate the ability to:

- Ability to apply this knowledge of science, mathematics, and engineering principles for solving problems.
- Ability to identify, formulate and solve electrical engineering problems in the broad areas like electrical and mechanical installations, electrical machines, power systems.
- Ability to exhibit management principles and function as a member of a multidisciplinary team.

Unit 1: Energy Scenario Energy sources-Primary and Secondary, Commercial and Non-commercial, Energy scenario in India and Global scenario, Energy Security, Energy and GDP, Energy Intensity, Energy conservation and its importance, Energy Conservation Act 2001 and related policies, Role of Non- conventional and renewable energy.

Unit 2: Energy Management and Integrated Resource Planning and Energy Audit

Definition and Objectives of Energy management, Energy management strategy, Key elements, Responsibilities and duties of Energy Manager, Energy efficiency Programs, Energy Monitoring System, Importance of SCADA, Analysis techniques, Cumulative sum of differences (CUSUM)

Definition, need of energy Audit, Types of Energy Audit, Maximizing system efficiency, Optimizing the input energy requirements, fuel and energy substitution, Energy Audit instruments and metering, thermography, SMART metering

Unit 3: Financial Analysis and Management Investment need, Financial analysis techniques, Calculation of Simple Pay-back period, return on investment, cash flows, risk and sensitivity analysis, Time value of money, Net Present value, Breakeven analysis, Cost optimization, Cost and Price of Energy services, Cost of Energy generated through Distributed Generation

Unit 4: Energy Efficiency in Electrical Utilities Electrical billing, power factor management, distribution and transformer losses, losses due to unbalance and due to harmonics, Demand Side Management, Demand-Response, Role of tariff in DSM and in Energy management, TOU tariff, Power factor tariff, Integrated Resource Planning and Energy Management Energy conservation in Lighting systems, HVAC, Electric Motors, Pump and Pumping systems

Unit 5: Energy Efficiency in Thermal Systems

Fuels and combustion, properties of Fuel Oil, coal and gas, storage and handling of fuels, principles of combustion, combustion of oil, coal, gas. Energy efficiency in Boilers, Steam systems, Furnaces, Insulation and Refractors.

Text Books:

- S. C. Tripathy, "Utilization of Electrical Energy", Tata Mc Graw Hill
- Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

21EE3262	III Year II Sem	Reliability Engineering	3L:0T:0P	3 Credits
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Prerequisite: Mathematics-III (Laplace Transforms, Numerical Methods and Complex variables)

Course Objectives:

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable systems

Course Outcomes: After completion of this course, the student will be able to

- model various systems applying reliability networks
- evaluate the reliability of simple and complex systems
- estimate the limiting state probabilities of repairable systems
- apply various mathematical models for evaluating reliability of irreparable systems

UNIT - I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Mathematical expected – variance and standard deviation Binomial Distribution: Concepts, properties, engineering applications.

UNIT- II

Network Modeling and Evaluation of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems - Series-Parallel systems- Partially redundant systems- Examples. Network Modeling and Evaluation of Complex Systems Conditional probability method- tie set, Cut-set approach- Event tree and reduced event tree methods- Relationships between tie and cut-sets- Examples.

UNIT – III

Probability Distributions In Reliability Evaluation: Distribution concepts, Terminology of distributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions –Poisson distribution – normal distribution, exponential distribution, Weibull distribution. Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems – Examples.

UNIT – IV

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Application. Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT - V

Frequency and Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach. Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS:

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press.
2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited

REFERENCES:

1. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

21EE4161	IV Year I Sem	Electric and Hybrid Vehicles	3L:0T:0P	3 Credits
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Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives:

- To understand the fundamental concepts of conventional vehicles.
- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To understand the performance of electrical propulsion units with different motor drives.
- To understand electrical energy storage using batteries, fuel cells and super capacitors.
- To understand various energy management strategies in electric vehicles.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Analyze mechanical design of conventional vehicles.
- Describe hybrid vehicles and their performance.
- Analyze various motor drives used in hybrid electrical vehicles
- Understand different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

UNIT-I: INTRODUCTION

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT-II: HYBRID ELECTRIC VEHICLES

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies.

UNIT III ELECTRIC TRAINS

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies.

Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives.

UNIT-IV: ENERGY STORAGE:

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage, battery management system, Fuel Cell based energy storage, Super Capacitor based energy storage, Flywheel-based energy storage, Hybridization of different energy storage devices.

UNIT-V: ENERGY MANAGEMENT STRATEGIES

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies. Review of various Energy management strategies.

TEXTBOOKS:

1. C.Mi, M.A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

REFERENCES:

1. M. Ehsani, Y. Gao, S.E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

21EE4162	IV Year I Sem	Energy Storage Systems	3L:0T:0P	3 Credits
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Prerequisite: Electro chemistry Course

Objective:

- To enable the student to understand the need for energy storage, devices and technologies available and their applications

Course Outcomes:

After completion of this course, the student will be able to

- analyze the characteristics of energy from various sources and need for storage
- classify various types of energy storage and various devices used for the purpose
- Identify various real time applications.

UNIT - I Electrical Energy Storage Technologies:

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak- demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT - II Needs for Electrical Energy Storage:

Emerging needs for EES, more renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III Features of Energy Storage Systems:

Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H₂), Synthetic natural gas (SNG).

UNIT - IV Types of Electrical Energy Storage systems:

Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES), Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT - V Applications:

Present status of applications, Utility use (conventional power generation, grid operation & service)

, Consumer use (uninterruptable power supply for large consumers), New trends in applications

, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

Text Books:

1. “James M. Eyer, Joseph J. Iannucci and Garth P. Corey “, “Energy Storage Benefits and Market Analysis”, Sandia National Laboratories, 2004.
2. The Electrical Energy Storage by IEC Market Strategy Board.

Reference Book:

1. “Jim Eyer, Garth Corey”, Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

**21ME3161 : FUNDAMENTALS OF MECHANICAL ENGINEERING
(OPEN ELECTIVE - I)**

B.Tech. III Year I Sem.

**LT P C
3 0 0 3**

Pre-Requisites: None

Course Objectives:

1. Understanding of basic principles of Mechanical Engineering is required in various field of engineering.
2. Understand about energy and Global warming
3. Understand about properties of steam and Steam boilers
4. Discuss about pumps and Compressors
5. Discuss about Various elements of power transmission systems

Course Outcomes:

By the end of this course, Students should be able to

1. Understand the Fundamentals of mechanical systems
2. Understand the Fundamentals of Properties of Gas, Steam & Steam Turbines
3. Choose Suitable IC Engines for Different applications and Classify the Heat Engines
4. Choose Suitable Pumps and Compressors, Refrigeration & Air conditioning Systems for Different Applications.
5. Classify Power Transmission Systems and Select Suitable Power transmission Systems and Materials for different applications.

UNIT - I

Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion.

UNIT - II

Properties of gases: Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between C_p and C_v , Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process

Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters.

Steam Boilers: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

UNIT - III

Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles.

Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.

UNIT - IV

Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming

Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.

Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.

UNIT - V

Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).

Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.

Engineering Materials: Types and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.

TEXT BOOKS:

1. Basic Mechanical Engineering / Pravin Kumar/ Pearson.
2. Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill.

REFERENCES:

1. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI.
2. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

**21ME3162: FUNDAMENTALS OF MANUFACTURING PROCESSES
(OPEN ELECTIVE –I)**

B.Tech. III Year I Sem.

**L T P C
3 0 0 3**

Prerequisites: Nil

Course Objectives:

1. Understand the philosophies of various Manufacturing process.
2. Understand the fundamentals of Welding Process
3. Discuss about various Hot working Processes
4. Understand about various Extrusion Processes
5. Discuss about Forging processes.

Course Outcomes:

1. Understand the steps in casting and different applications of casting process.
2. Understand the welding process and Select suitable welding techniques for different applications
3. Classify the Hot working and Cold Working process and explain the different Hot working and Cold Working Processes
4. Understand Extrusion process and Select suitable extrusion process for manufacturing of different components.
5. Understand Forging process and Select suitable Forging process for different applications

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill.

2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCES:

1. Metal Casting / T.V Ramana Rao / New Age.
2. Métal Fabrication Technology/ Mukherjee/PHI.

**21ME3261: FUNDAMENTALS OF RAPID PROTOTYPING
(OPEN ELECTIVE –II)**

B.Tech. III Year II Sem.

**L T P C
3 0 0 3**

Prerequisites: CAD

Course Objectives: Impart knowledge on

1. Understand the concept of Rapid Prototyping
2. Understand the Rapid Prototyping Processes
3. Construction of the part or assembly using RP technology
4. Virtual world of Rapid Prototyping

Course Out comes: At the end of the course students will have ability to

1. Understand the importance of RP technology and its applications
2. Understand the liquid and solid based RP processes
3. Recognize the need of powder-based RP Technologies
4. Realize the importance of RP file extensions and its software's
5. Know the real-time applications of RP Technology

UNIT-I

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes.

UNIT-II

Liquid based Rapid Prototyping Systems: Vat-Photo Polymerization, Working Principle, subsystems, Applications, Advantages and Disadvantages, Case studies.

Solid based Rapid Prototyping Systems: Subsystems, Fusion Deposition Modeling: Feeding Mechanism, General Materials, Build plate adhesion, Applications, Advantages and Disadvantages, Case studies.

UNIT-III

Powder Based Rapid Prototyping Systems: Selective Laser Sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Powder Based Rapid Prototyping Systems: Selective Laser Melting (SLM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT-IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid Prototyping Software's.

UNIT-V

Applications of RP Technologies: Aerospace, Defense, Consumer goods, Medical, Mold Industry, Automotive and architecture.

TEXTBOOKS:

1. Rapid prototyping; Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific Publications
2. Rapid Manufacturing /D.T. Pham and S.S. Dimov/Springer

**21ME3262: QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS
(OPEN ELECTIVE –II)**

B.Tech. III Year II Sem.

**L T P C
3 0 0 3**

Course Objectives:

1. Understand the problem, identifying decision variables, objective and constraints.
2. Formulation of Optimization Problem by constructing Objective Function and Constraint functions.
3. Learn to select appropriate Optimization Technique for the formulated Optimization Problem.
4. Understood the procedure involved in the selected Optimization Technique.
5. Solve the Optimization Model with the selected Optimization Technique.

Course Outcomes: By the end of this course, Students should be able to

1. Formulate and Solve Linear Programming Models
2. Apply Transportation and Assignment models for finding the optimum solutions
3. Formulate the suitable Replacement models for finding the Optimum Replacement period
4. Apply the Game theory concepts for finding the optimum business decisions
5. Understand Queuing systems and formulate the suitable queuing system and simulation model for finding the optimum solutions.

UNIT – I:

Introduction and Linear Programming: Nature and Scope of O.R.–Analyzing and Defining the Problem, Developing A Model, Types of models, Typical Applications of Operations Research; Linear programming: Graphical Method, Simplex Method; Solution methodology of Simplex algorithm, Artificial variables; Duality Principle, Definition of the Dual Problem, Primal - Dual Relationships.

UNIT – II:

Transportation and Assignment Models: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, & Variants of assignment problems. Traveling Salesman Problem.

UNIT – III:

Replacement Model: Replacement of Capital Cost items when money's worth is **not** considered, Replacement of Capital Cost items when money's worth is considered, Group replacement of low-cost items.

UNIT – IV:

Game Theory and Decision Analysis: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, arithmetic methods. Decision Analysis: Introduction to Decision Theory, Steps In the Decision Making, the Different environments In Which Decisions Are Made, Criteria For Decision Making Under Risk and Uncertainty, The Expected Value Criterion With Continuously Distributed Random Variables, Decision Trees, Graphic Displays of the Decision Making Process.

UNIT – V:

Queuing Theory and Simulation: Basic Elements of the Queuing Model, Poisson Arrivals and Exponential Service times; Different Queuing models with FCFS Queue discipline: single service station and infinite population, Single service station and finite population, Multi service station models with infinite population. **Simulation:** Nature and Scope, Applications, Types of simulation, Role of Random Numbers, Inventory Example, Queuing Examples, Simulation Languages.

TEXTBOOKS:

1. Operations Research: Theory and Applications/ J. K. Sharma: / Macmillan, 2008.
2. Operations Research/ Er. Prem Kumar Gupta & Dr. D. S. Hira / S. Chana, 2016.

REFERENCES:

1. Introduction To Operations Research; Hillier/Lieberman/ TMH, 2008.
2. Render: Quantitative Analysis for Management, Pearson, 2009.
3. Quantitative Analysis for Business Decisions / Sridharabhat/ HPH, 2009.
4. Operations Research / R. Panneerselvam/ PHI, 2008.
5. Operations Research: An Introduction / Hamdy, A. Taha/ PHI, 2007.

**21ME4161: TOTAL QUALITY MANAGEMENT
(OPEN ELECTIVE –III)**

B.Tech. IV Year I Sem.

**LT P C
3 0 0 3**

UNIT - I

Introduction, The concept of TQM, Quality and Business performance, attitude, and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs. Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT -II

Customer Focus and Satisfaction: Process vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. **Bench Marking:** Evolution of Bench Marking, meaning of bench marking, benefits of bench marketing, the bench marking procedure, pitfalls of bench marketing.

UNIT- III

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organization, Quality Circles, seven Tools of TQM: Stratification, check sheet, Scatter diagram, Ishikawa diagram, paneto diagram, Kepner &Tregoe Methodology.

UNIT- IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost information, Accounting Systems and Quality Management.

UNIT -V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOK:

1. Total Quality Management / Joel E. Ross/Taylor and Franscis Limited.
2. Total Quality Management/P. N. Mukherjee/PHI.

REFERENCE S:

1. Beyond TQM / Robert L.Flood.
2. Statistical Quality Control / E.L. Grant.
3. Total Quality Management:A Practical Approach/H. Lal.
4. Quality Management/Kanishka Bedi/Oxford University Press/2011.

21ME4162: FUNDAMENTALS OF ROBOTICS
(OPEN ELECTIVE – III)

B.Tech. VI Year I Sem.

L T P C
3 0 0 3

Pre-requisites: None

Course Objectives:

- The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Make the students acquainted with the theoretical aspects of Robotics.
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

Course outcomes: After this completion of this course, the student should be able to

- Understand the basic components of robots.
- Differentiate types of robots and robot grippers.
- Model forward and inverse kinematics of robot manipulators.
- Analyze forces in links and joints of a robot.
- Programme a robot to perform tasks in industrial applications.
- Design intelligent robots using sensors.

UNIT - I

Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator. Components of Industrial robotics- recession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

UNIT - II

Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper , vaccum cup gripper-considerations in gripper selection & design . Industrial robots specifications. Selection based on the Application.

UNIT - III

Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots

UNIT - IV

Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme. Control- Interaction control, Rigid Body mechanics, Control architecture- position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.

UNIT - V

Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc. Machine (robot) vision:

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc Graw Hill.
2. Introduction to Robotics / John J. Craig/ Pearson.

REFERENCES:

1. Theory of Applied Robotics /Jazar/Springer.
2. Robotics / Ghosal / Oxford.

21EC3161: PRINCIPLES OF ELECTRONICS AND COMMUNICATION
(OPENELECTIVE-I)

B.Tech. III Year I Sem.

L T P C
3 0 0 3

Course Objectives:

1. Able to understand the basic concepts of modulation in communications and evaluation of its parameters.
2. Able to understand different modulation schemes in analog and digital communications.
3. Able to have the basic knowledge about telecommunication systems, Internet and communication networking.
4. Able to understand the basic concepts and techniques with satellite communications and optical communications.
5. Able to understand the concepts behind cellular and mobile communications and able to apply these concepts in wireless networking.

Course Outcomes:

1. understands the different parametric measurable in communication systems
2. Understands the basic concepts of different modulation techniques.
3. Understands the basic concepts of switching networks.
4. Understands the basic concepts of satellite and optical communications
5. Understands the basic concepts of cellular mobile communications and wireless technologies.

UNIT – I

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

UNIT – II

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT – III

Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

UNIT IV

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems. Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT V

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA. Wireless Technologies: Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008
2. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILL EDUCATION, 1999
3. Theodore Rapp port, Wireless Communications - Principles and practice, PrenticeHall, 2002.

REFERENCES:

1. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications
2. Introduction to data communications and networking, Wayne Tomasi, Pearson Education, 2005

21EC3162: DIGITAL SYSTEMS
(OPENELECTIVE-I)

B.Tech. III Year I Sem.

L T P C
3 0 0 3

Course Objectives:

1. Understand fundamental concepts of Digital Systems, Boolean theorems, various logic gates
2. Understand the design of combinational and Arithmetic Circuits
3. Understand the applications of sequential circuits
4. Acquire knowledge on various types of Memories
5. Familiarize the concepts of Opamp and A/D, D/A converters

Course Outcomes:

1. Understand the concepts of Digital Systems, Boolean theorems, various logic gates
2. Understand the design of combinational and Arithmetic Circuits
3. Understand the applications of sequential circuits
4. Understand various types of Memories
5. Understand the concepts of Opamp and A/D , D/A converters

UNIT – I

Introduction: Definition of Analog & Digital information. Characteristics of Digital Circuits, Advantages of Digital systems, Introduction to ICs, Classification of Analog and Digital ICs, Basic Logic gates, Boolean Algebra- Theorems

UNIT – II

Combinational Circuits: Multiplexer, Demultiplexer, Decoder, Encoder, Priority Encoders
Arithmetic circuits : Half Adder and Full adder Circuits, multibit ripple-carry adder and subtractor circuits. Realization of these circuits using Multiplexers.

UNIT – III

Sequential Circuits: Definition, Elements of sequential circuits - Latches and Registers, Different kinds of flip-flops – R-S, J-K, Master-slave arrangement, D, and T type registers;
Typical sequential circuits -counters, shift registers and sequence generator, synchronous and asynchronous circuits.

UNIT IV

Memories: RAM- SRAM, DRAM; ROM and its types, PLA, PAL, Secondary Memories

UNIT V

Introduction to Opamps: Inverting and Non-Inverting Amplifiers, Virtual ground Concept, Analog to Digital and Digital to Analog Converters

Text Books

4. Digital Design, 5/e, Morris Mano and Michael D. Cilette, Pearson, 2011
5. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994
6. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p)Ltd., 6thEdition, 2018.

REFERENCES:

1. Modern Digital electronics- RP Jain 4th Edition, McGraw Hill, 2010
2. Switching Theory and Logic Design – A. Anand Kumar, 3rd Edition, PHI, 2013.
3. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI, 2015

21EC4161: MICROPROCESSORS AND MICROCONTROLLERS
(Open Elective–II)

B.Tech IV Year I Semester

L	T	P	C
3	-	-	3

Course Objectives:

1. To familiarize the architecture of microprocessors and microcontrollers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To develop programming skills using 8051 based systems
4. To understand the concepts of ARM architecture
5. To study the basic concepts of Advanced ARM processors

Course Outcomes: Upon completing this course, the student will be able to

1. Understands the internal architecture, organization and assembly language programming of 8086 processors.
2. Understands the internal architecture, organization and assembly language programming of 8051/controllers
3. Understands the interfacing techniques to 8051 based systems.
4. Understands the internal architecture of ARM processors and
5. To outline basic concepts of advanced ARM processors.

UNIT -I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT -II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT -III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232, USB.

UNIT –IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications - K. Uma Rao, Andhe Pallavi, Pearson, 2009

**21EC4162: Basic principles of VLSI DESIGN
(Open Elective–II)**

B.Tech IV Year I Semester

L	T	P	C
3	-	-	3

Prerequisites - Electronic Devices and Circuits, Digital logic Design

Course Objectives: The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs and electrical properties using MOS Transistor analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

Course Outcomes: Upon completing this course, the student will be able to

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
- Draw the layout of any logic circuit which helps to understand and estimate parasitic of any logic circuit
- Understand Gate level designs of different gates and driving capacitive Loads.
- Provide design concepts required to design building blocks of data path using gates and design of simple memories using MOS Transistors.
- Design simple logic circuit using PLA, PAL, FPGA and CPLD and Understand concept of CMOS Testing

UNIT – I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds} V_{ds} relationships, MOS transistor threshold Voltage, g_m , g_{ds} , Figure of merit ω_0 ; Pas transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT - II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT – III

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT – IV

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT – V

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.

REFERENCE BOOKS:

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.

21EC4261: EMBEDDED SYSTEM DESIGN
(Open Elective–III)

B.Tech IV Year II Semester

L	T	P	C
3	-	-	3

Course objectives

1. Understand the basics and applications of an embedded system
2. learn the method of designing an embedded system for any type of application
3. Firmware design approach of an embedded system
4. understand operating system concepts , RTOS Architecture
5. understand the Task Communication and Device Drivers. How to Choose RTOS

Course outcomes

By the end of this course, Students should be able to

1. understand the design flow of an embedded system and they can implement this on real time embedded systems
2. able to differentiate different types of processors and interfacing memory types to design an embedded systems
3. design control circuits for embedded system and develop the programs using programming languages
4. to learn about RTOS for Embedded system Design , multiprocessing , multitasking techniques.
5. analyze Task Communications and Synchronization techniques in RTOS and task synchronization and latency issues

UNIT – I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT – II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS). Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT – III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT – IV

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT – V

Integration and Testing of Embedded Hardware and Firmware: Integration of Hardware and Firmware, Boards Bring up

The Embedded System Development Environment: The Integrated Development Environment (IDE), Types of files generated on Cross-Compilation, Disassembler / Decompiler, Simulators, Emulators and Debugging, Target Hardware Debugging, Boundary Scan.

TEXT BOOKS:

1. Shibu K V, “Introduction to Embedded Systems”, Second Edition, Mc Graw Hill

REFERENCES:

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill

2. Frank Vahid and Tony Givargis, “Embedded Systems Design” - A Unified Hardware/Software Introduction, John Wiley

3. Lyla, “Embedded Systems” –Pearson

4. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

21EC4262: Electronic Measuring and Instruments (Open Elective–III)

B.Tech IV Year II Semester

L	T	P	C
3	-	-	3

Course Objectives:

1. To understand the various measuring systems functions and metrics for performance analysis.
2. To understand the principle of operation and working of different electronic instruments.
3. To understand the construction and principle of operation of different electronic instruments via oscilloscope and special purpose oscilloscopes.
4. To understand the working principles of various transducers
5. To aware students how to use bridges to measure resistance, capacitance, and inductance using various measuring techniques.

Course Outcomes: On completion of this course student can be able to

1. Understand and identify the various electronic instruments based on their specifications for carrying out a particular task of measurement..
2. Analyze various types of signal generators and signal analysers for generating and analysing various real time signals.
3. Analyze different types of oscilloscopes and acquire the knowledge of measuring parameters of different real time signals.
4. Measure various physical parameters by appropriately selecting the transducers.
5. Understand about bridges for the measurement of resistance, capacitance and inductance and also can learn how all the physical parameters can be measured.

UNIT - I

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT - III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT - IV

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT - V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H. S. Kalsi – McGraw Hill Education, 2nd Edition 2004.
3. Electronic Instrumentation and Measurements – David A. Bell, 3rd Edition Oxford Univ. Press, 2013.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W.D. Cooper: PHI 5th Edition, 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage MC GRAW HILLEUCATION Reprint, 2009.
4. Industrial Instrumentation: T.R. Padmanabham Springer, 2009.

21CS3161: FUNDAMENTALS OF SOFTWARE ENGINEERING

(Open Elective - I)

B.Tech. III Year I Sem.

L T P C

3 - - 3

Prerequisites:

- Computer Programming
- Database Management Systems

Course Objectives

- To understand fundamental principles of Software engineering, and their application in the development of software products.
- To understand and create the software requirements specifications document.
- To understand and use unified modeling language for specifying, analysis and designing.
- To understand testing strategies for testing software applications
- To understand Software metrics and Risk Management strategies to identify potential problems before they occur.

Course Outcomes

- Able to apply the software engineering lifecycle phases communication, planning, analysis, design, construction, and deployment.
- Ability to translate end-user requirements into system and software requirements into Software Requirements specification Document (SRS)
- Able to apply UML in object-oriented software modeling to develop computer software.
- Able to identify problems in software and will be able to develop a simple testing report.
- To understand Software Metrics, potential risk and how to manage them through RMMM plan.

UNIT - I

Introduction: The evolving role of software, Changing Nature of Software, legacy software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models, COCOMO Model.

Process Models: The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process.

UNIT - II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Requirements Engineering Process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management, Software requirements documents

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT - III

Modeling Techniques using UML: The Unified Approach to Modeling, Structural and Behavioral Diagrams.

Design Engineering: Data Flow Diagrams, Design process and Design quality, Design concepts, the design model, pattern-based software design.

Creating an architectural design: Architectural styles and patterns, Architectural Design, assessing alternative architectural designs.

UNIT - IV

Implementation: Structured coding Techniques, Coding Styles-Standards and Guidelines.

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Regression Testing, Unit Testing, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

Quality Management: Quality concepts, software quality assurance, software reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

UNIT - V

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, Mc Graw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. The unified modeling language user guide Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.

REFERENCES:

1. "Software Engineering", Ian Sommerville, Addison-Wesley, 9th Edition, 2010, ISBN- 13: 978- 0137035151.
2. Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.
4. Software testing techniques by Boris Beizer, dreamtech.
5. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiley.
6. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill Companies.

21CS3162: INTRODUCTION TO DATA ANALYTICS

(Open Elective - I)

B.Tech. III Year I Sem.

L T P C

3 - - 3

Prerequisites

- Data Base Management Systems, Computer Oriented Statistical Methods

Course Objectives

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis.
- To develop problem solving abilities using Mathematics.
- To apply algorithmic strategies while solving problems.
- To understand the various search methods and visualization techniques.

Course Outcomes

- Identify the various sources of Big Data.
- Apply several key big data technologies used for storage, analysis and manipulation of data.
- Design methodologies to extract data from structured and un-structured data for analytics
- Apply Regression algorithms to perform data analytics.
- To carry out standard data visualization and formal inference processors.

UNIT - I

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data pre-processing, Missing Values - Outlier Detection and Treatment.

UNIT- II

Introduction to Tools and Environment, Application of Modelling in Business, Databases & Types of data and variables, Data Modelling Techniques, Missing imputations etc. Need for Business Modeling.

UNIT -III

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - IV

Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Over fitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction.

UNIT - V :

Data Visualization: Pixel Oriented Visualization Techniques, Geometric Projection Visualization

Techniques, Icon based Visualization Techniques Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.
2. Associate Analytics Handbook.

REFERENCES:

1. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.
2. Michael Minelli, Michele Chambers, AmbigaDhiraj ,“Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends”, John Wiley & Sons, 2013.
3. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014

21CS3263: IoT ESSENTIALS FOR APPLICATION DEVELOPMENT

(Open Elective - II)

B.Tech. III Year II Sem.

L T P C

3 - - 3

Course Objectives

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes

- Known basic protocols in sensor networks.
- Program and configure Arduino boards for various designs.
- Python programming and interfacing for Raspberry Pi.
- Design IoT applications in different domains.
- Be able to measure and analyze the performance of a fog computing application.

UNIT – I

Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II

Machine-to-Machine Communications: Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduin.

IOT Gateway: Introduction Gateway, Edge verses Fog computing, Communication models-edge, fog & Machine to Machine.

UNIT – III

Introduction to Python programming, Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - IV

Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals Implementation of IoT with Raspberry Pi,

UNIT – V

Introduction to Software defined Network (SDN), SDN for IoT, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Make sensors": Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCES:

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenege Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

21CS3264: CLOUD COMPUTING AND ITS APPLICATIONS

(Open Elective - II)

B.Tech. III Year II Sem.

L T P C

3 - - 3

Pre-requisite

- A course on “Computer Networks”.
- A course on “Operating Systems”.
- A course on “Distributed Systems”.

Course Objectives

- This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, service-oriented architectures, cloud programming and software environments, resource management.

Course Outcomes

- Course Outcomes Description Bloom’s Taxonomy Levels CO1 Understand the
- Concepts of computing paradigms.
- Ability to understand the concepts of cloud computing and Deployment Models
- Ability to understand various service of a network connectivity and managing cloud.
- Understanding cloud service providers.
- Understand the concepts of real time applications.

UNIT-I:

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II:

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT-III:

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud,

UNIT-IV:

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Platform as a Service, Characteristics of PaaS, Pros and Cons of PaaS, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS.

UNIT-V:

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCES:

1. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg and Andrzej M. Goscinski, Wiley,2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly, SPD,rp2011.

21CS4165: INTRODUCTION TO ARTIICIAL INTELLIGENCE

(Open Elective - III)

B.Tech. IV Year I Sem.

L T P C
3 - - 3

Pre-Requisites: Mathematics, Data Structures

Course Objectives:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications.

Course Outcomes: After completion of course, students would be able to:

- Solve basic AI based problems.
- Define the concept of Artificial Intelligence.
- Apply AI techniques to real-world problems to develop intelligent systems.
- Select appropriately from a range of techniques when implementing intelligent systems.

UNIT - I

Introduction: Overview of AI problems, AI problems as NP, NP-Complete and NP Hard problems. Strong and weak, neat and scruffy, symbolic and sub-symbolic, knowledge-based and data driven AI.

UNIT -II

Search Strategies: Problem spaces (states, goals and operators), problem solving by search, Heuristics and informed search, Minmax Search, Alpha-beta pruning. Constraint satisfaction (backtracking and local search methods).

UNIT - III

Knowledge representation and reasoning: propositional and predicate logic, Resolution and theorem proving, Temporal and spatial reasoning. Probabilistic reasoning, Bayes theorem. Totally-ordered and partially-ordered Planning. Goal stack planning, Nonlinear planning, Hierarchical planning.

UNIT - IV

Learning: Learning from example, Learning by advice, Explanation based learning, Learning in problem solving, Classification, Inductive learning, Naive Bayesian Classifier, decision trees. Natural Language Processing: Language models, n-grams, Vector space models, Bag of words, Text classification. Information retrieval.

UNIT - V

Agents: Definition of agents, Agent architectures (e.g., reactive, layered, cognitive), Multi-agent systems- Collaborating agents, Competitive agents, Swarm systems and biologically inspired models.

Intelligent Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition. Key Application Areas: Expert system, decision support systems, Speech and vision, Natural language processing, Information Retrieval, Semantic Web.

Reference Books:

1. Artificial Intelligence by Elaine Rich, Kevin Knight and Shiva shankar B Nair, Tata McGraw Hill.
2. Introduction to Artificial Intelligence and Expert Systems by Dan W. Patterson, Pearson Education.
3. Artificial Intelligence: A Modern Approach by S. Russell and P. Norvig, Prentice Hall

21CS4166: ETHICAL HACKING

B.Tech. IV Year I Sem.

L T P C
3 - - 3

Course Objectives:

- To learn about the importance of information security.
- To learn different scanning and enumeration methodologies and tools.
- To understand various hacking techniques and attacks.
- To be exposed to programming languages for security professionals.
- To understand the different phases of penetration testing.

Course Outcomes:

- Identify threats to computers.
- Defend hacking attacks.
- Protect data assets.
- Defend a computer against a variety of security attacks using various tools.
- Practice and use safe techniques on the World Wide Web.

UNIT-I

INTRODUCTION TO HACKING

Introduction to Hacking – Importance of Security – Elements of Security – Phases of an Attack – Types of Hacker Attacks – Hacktivism – Vulnerability Research – Introduction to Foot printing – Information Gathering Methodology – Foot printing Tools – WHOIS Tools – DNS Information Tools – Locating the Network Range – Meta Search Engines.

UNIT II

SCANNING AND ENUMERATION

Introduction to Scanning – Objectives – Scanning Methodology – Tools – Introduction to Enumeration – Enumeration Techniques – Enumeration Procedure – Tools

UNIT III

SYSTEM HACKING

Introduction – Cracking Passwords – Password Cracking Websites – Password Guessing – Password Cracking Tools – Password Cracking Countermeasures – Escalating Privileges – Executing Applications – Key loggers and Spyware.

UNIT IV

PROGRAMMING FOR SECURITY PROFESSIONALS

Programming Fundamentals – C language – HTML – Perl – Windows OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures – Linux OS Vulnerabilities – Tools for Identifying Vulnerabilities – Countermeasures.

UNIT V

PENETRATION TESTING

Introduction – Security Assessments – Types of Penetration Testing- Phases of Penetration Testing– Tools – Choosing Different Types of Pen-Test Tools – Penetration Testing Tools .

REFERENCES:

1. 1. EC-Council, "Ethical Hacking and Countermeasures: Attack Phases", Cengage Learning, 2010.
2. 2. Jon Erickson, "Hacking, 2nd Edition: The Art of Exploitation", No Starch Press Inc., 2008.
3. 3. Michael T. Simpson, Kent Backman, James E. Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning, 2013.
4. 4. Patrick Engebretson, "The Basics of Hacking and Penetration Testing – Ethical Hacking and Penetration Testing Made Easy", Second Edition, Elsevier, 2013.
5. 5. RafayBoloach, "Ethical Hacking and Penetration Testing Guide", CRC Press, 2014.

21IT3161: ESSENTIALS OF DIGITAL TRANSFORMATION

B.Tech III Year I Semester

L	T	P	C
3	-	-	3

Course Objectives:

- Provide an introduction to Digital Transformation
- Introduces the concept of cybersecurity
- To understand the basic Threat Intelligence Methodological Approach.
- To elucidate Intrusion Detection and prevention
- Introduce the Types of Machine Learning and deep learning.

Course Outcomes:

- Will be able to explain the essentials of digital transformation.
- Illustrate various concepts of cybersecurity.
- Ability to understand the basic Threat Intelligence Methodological Approach
- Able to understand Intrusion Detection and prevention.
- Will be able to explain the concept of Machine Learning and deep learning.

UNIT - I

Introduction to Digital Transformation: Digital Transformation, Cybersecurity, Fourth Technological Wave, Circular Economy.

UNIT – II

Introduction to Cybersecurity: Introduction, CIA Triad, Cyber Threat Attacks and Cyber Threat Intentions, Security Risk, Likelihood, and Consequence Level, Risk Matrix, Cyber Threat Attack Types.

UNIT – III

Threat Intelligence: Introduction, Threat Intelligence Methodological Approach, Known-Knowns, Known-Unknowns, Unknown-Unknowns, Digital Forensic and Threat Intelligence Platforms, Threat Attack Profiling, Threat Intelligence, and Threat Lifecycle, Threat Intelligence Sharing, and Management Platforms.

UNIT – IV

Intrusion Detection and Prevention: Intrusion Detection, Anomaly Intrusion Detection, Misuse Intrusion Detection, Disadvantages of Anomaly and Misuse Intrusion, Specification-Based Intrusion Detection, Intrusion Type Characteristics and Detection, Intrusion Detection System Architecture, Intrusion Prevention, Intrusion Prevention System, Intrusion Detection and Prevention Architecture, Intrusion Detection Capability Metric, Intrusion Detection, and Prevention Methods.

UNIT - V

Machine Learning and Deep Learning: Introduction to Machine Learning, Types of Machine Learning, Comparison of Machine Learning Methods, Machine Learning, and Intrusion Detection, Introduction to Deep Learning, Deep Learning Methods Used in Cybersecurity.

TEXTBOOKS

1. Dietmar P. F. Möller, Cybersecurity in Digital Transformation: Scope and Applications, ISSN 2522-5561 ISSN 2522-557X (electronic), Springer Briefs on Cyber Security Systems and Networks, ISBN 978-3-030-60569-8 ISBN 978-3-030-60570-4 (eBook). <https://doi.org/10.1007/978-3-030-60570-4>

REFERENCE BOOKS

- [1] Steven Van Belleghem, When Digital Becomes Human: The Transformation of Customer Relationships, Kogan Page, Year: 2015, ISBN: 0749473231,9780749473235.
- [2] Leignel, Jean-Louis; Staar, Adrien; Ungaro, Thierry, Digital transformation: information systems governance, ISTE, Ltd., Wiley, Year: 2016, ISBN: 9781119377900.

21IT3162: FUNDAMENTALS OF DATABASE SYSTEMS

L	T	P	C
3	-	-	3

III B.Tech Year I Semester

Prerequisites: A course on “Data Structures”.

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT - IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols,
Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes- Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM),

TEXT BOOKS:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, V edition.3rd Edition
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
- 6.Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

21IT3261: MOBILE APPLICATION DEVELOPMENT

B.Tech III Year II Semester

L	T	P	C
3	-	-	3

Prerequisites

1. Acquaintance with JAVA programming
2. A Course on DBMS

Course Objectives

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improve their skills in using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on a mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

Course Outcomes

- The student understands the working of Android OS Practically.
- The student will be able to develop Android user interfaces
- The student will be able to develop, deploy and maintain the Android Applications.

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus, etc, Resources for different devices and languages, Runtime Configuration Changes

Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid, and Table Layouts-User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle - Buttons, Checkboxes, Spinners, Dialog, and pickers - Event Handling – Handling clicks or changes of various UI components.

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing, and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activities, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV

Persistent Storage: Files – Using application-specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving, and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve, and update)

TEXTBOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOK:

- [1] Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013

21IT3262: WEB DEVELOPMENT

L	T	P	C
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B.Tech. III Year II Semester

Course Objectives:

1. To introduce PHP language for server-side scripting
2. To introduce XML and processing of XML Data with Java.
3. To introduce Server-side programming with Java Servlets and JSP
4. To introduce Client-side scripting with JavaScript and AJAX.

Course Outcomes

1. Gain knowledge of client-side scripting, validation of forms, and AJAX programming
2. Understand server-side scripting with the PHP language
3. Understand what XML is and how to parse and use XML Data with Java 4.
4. To introduce Server-side programming with Java Servlets and JSP

UNIT- I

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists, etc., and Handling File Uploads. Connecting to a database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies

File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting, etc. on the text and binary files, listing directories.

UNIT- II

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

UNIT - III

Introduction to Servlets: Common Gateway Interface (CGI), the Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling HTTP Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

UNIT - IV

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

UNIT - V

Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, the scope of variables, and functions. event handlers (onclick, onsubmit, etc.), Document Object Model, and Form validation.

TEXTBOOKS:

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw-Hill

REFERENCE BOOKS:

- [1] Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
- [2] Java Server Pages —Hans Bergsten, SPD O'Reilly,
- [3] Java Script, D.Flanagan
- [4] Beginning Web Programming-Jon Duckett WROX.
- [5] Programming world wide web, R.W.Sebesta, Fourth Edition, Pearson.
- [6] Internet and World Wide Web — How to program. Dietel and Nieto, Pearson.

21IT4161: FUNDAMENTALS OF INFORMATION SECURITY

L	T	P	C
3	-	-	3

B.Tech IV Year I Semester

Prerequisites:

- Knowledge of computer networks.

Course Objectives:

- To impart knowledge on network security issues, services, goals, and mechanisms.
- To classify various algorithms and fundamental ideas of public-key cryptography.
- To explain the authentication codes and digital signatures.
- To analyze the security of communication systems, networks, and protocols.

Course Outcomes:

- Demonstrate knowledge of cryptography and network security concepts and applications.
- Ability to compare various cryptographic algorithms.
- Ability to identify the requirement of Message Authentication and hash functions.
- Ability to apply security principles in networks and mobile devices.
- Ability to analyze various E-Mail privacy techniques.

UNIT- I

Introduction to Cryptography: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT- II

Symmetric and Asymmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Differential and Linear Cryptanalysis, Block cipher modes of operation, Stream ciphers, RC4. Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT- III

Message Authentication Algorithms and Hash Functions: Message Authentication, MD5, Secure Hash Algorithm (SHA512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

UNIT- IV

Transport-level and Wireless Network Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), HTTPS, Secure Shell (SSH), Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security.

UNIT-V

E-Mail and IP Security: Pretty Good Privacy, S/MIME, IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange.

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single Sign On, Secure Inter-branch Payment Transactions, Cross-site Scripting Vulnerability.

TEXTBOOKS:

- [1] Cryptography and Network Security: Principles and Practice: William Stallings, Pearson Education, 6th Edition.
- [2] Cryptography and Network Security: Atul Kahate, McGraw Hill, 3rd Edition.

REFERENCE BOOKS:

- [1] Cryptography and Network Security: C K Shyamala, N Harini, Dr. T R Padmanabhan, Wiley India, 1st Edition.
- [2] Cryptography and Network Security: Forouzan Mukhopadhyay, McGraw Hill, 3rd Edition.
- [3] Information Security, Principles, and Practice: Mark Stamp, Wiley India.
- [4] Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
- [5] Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
- [6] Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

21IT4162: FUNDAMENTALS OF COMPUTER NETWORKS

L	T	P	C
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B.Tech IV Year I Semester

Prerequisites

- Basic knowledge on computer programming languages

Course Objectives:

- To introduce the fundamental various types of computer networks.
- To introduce the TCP/IP and OSI models with merits and demerits.

Course Outcomes:

Students will be able:

- To explain the OSI Reference Model and TCP/IP Models and in particular have a good knowledge of Layers.
- To apply error correction and detection techniques of Data Link Layer.
- To identify the best routing techniques by applying algorithms of Network Layer.
- To explain the Transport Layer Protocols.
- To explain the Application Layer Protocols, Cryptography and Network security.

UNIT - I

Data Communications: Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN

Physical Layer: Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT - II

Data Link Layer: Introduction, Framing, and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols.

Medium Access sub Layer: ALOHA, CSMA/CD, LAN – Ethernet IEEE 802.3, IEEE 802.5 – IEEE 802.11, Random access, Controlled access, Channelization.

UNIT - III

Network Layer: Logical Addressing, Inter-networking, Tunnelling, Address mapping, ICMP, IGMP.

UNIT - IV

Transport Layer: Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

UNIT - V

Application Layer: Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW,HTTP, SNMP.

TEXT BOOKS:

1. Data Communications and Networking, Behrouz A. Forouzan , Fourth Edition TMH, 2006.
2. Computer Networks, Andrew S Tanenbaum, 4th Edition. Pearson Education, PHI.

REFERENCE BOOKS:

1. Data communications and Computer Networks, P.C .Gupta, PHI.
2. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition,Pearson Education.
3. Understanding communications and Networks, 3rd Edition, W.A. Shay, Cengage Learning.
4. Computer Networking: A Top-Down Approach Featuring the Internet. James F. Kurose &Keith W. Ross, 3 rd Edition, Pearson Education.
5. Data and Computer Communication, William Stallings, Sixth Edition, Pearson Education,2000.

**21BU3161: FUNDAMENTAL OF MANAGEMENT AND
ORGANIZATIONAL BEHAVIOR
(Open Elective – I)**

Course Objectives:

The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Behaviour.

UNIT- I:

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organizational Behaviour. Cognitive Processes-I: Perception and Attribution: Nature and importance of Perception – Perceptual selectivity and organization – Social perception – Attribution Theories – Locus of control – Attribution Errors – Impression Management.

UNIT-II:

Cognitive Processes-II: Personality and Attitudes – Personality as a continuum – Meaning of personality - Johari Window and Transactional Analysis - Nature and Dimension of Attitudes – Job satisfaction and organizational commitment-Motivational needs and processes- Work-Motivation Approaches Theories of Motivation- Motivation across cultures - Positive organizational behaviour: Optimism – Emotional intelligence – Self-Efficacy.

UNIT- III:

Dynamics of OB-I: Communication – types – interactive communication in organizations – barriers to communication and strategies to improve the follow of communication - Decision Making: Participative decision-making techniques – creativity and group decision making. Dynamics of OB –II Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intraindividual conflict - strategies to cope with stress and conflict.

UNIT- IV:

Dynamics of OB –III Power and Politics: Meaning and types of power – empowerment - Groups Vs. Teams – Nature of groups – dynamics of informal groups – dysfunctions of groups and teams – teams in modern work place.

UNIT- V:

Leading High performance: Job design and Goal setting for High performance- Quality of Work Life Socio technical Design and High-performance work practices - Behavioural performance management: reinforcement and punishment as principles of Learning –Process of Behavioural modification - Leadership theories - Styles, Activities and skills of Great leaders.

REFERENCE BOOKS:

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
2. McShane: Organizational Behaviour, 3e, TMH, 2008
3. Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
4. Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.
5. Pierce and Gardner: Management and Organisational Behaviour: An Integrated perspective, Thomson, 2009.
6. Robbins, P. Stephen, Timothy A. Judge: Organisational Behaviour, 12/e, PHI/Pearson, New Delhi, 2009.
7. Pareek Udai: Behavioural Process at Work: Oxford & IBH, New Delhi, 2009.
8. Schermerhorn: Organizational Behaviour 9/e, Wiley, 2008.
9. Hitt: Organizational Behaviour, Wiley, 2008
10. Aswathappa: Organisational Behaviour, 7/e, Himalaya, 2009
11. Mullins: Management and Organisational Behaviour, Pearson, 2008.

21BU3162: BUSINESS LAW AND ETHICS
(Open Elective – I)

Course Objective:

- To understand the Legal and Regulatory Framework for doing business in India.
- To understand corporate governance in an organization.
- To understand essential elements of a valid contract.
- To know different types of Negotiable Instruments.
- To understand the value and importance of Ethics in business.

Course Outcome: Students will be able to understand

- About Company Law to incorporate a business
- Corporate governance of a company
- Prerequisites to execute valid negotiable instruments
- Necessity of doing business on ethical parameters.
- To protect business interests from Cyber Crimes

UNIT – I

Companies Act, 2013: Steps and procedure for incorporation of the company, Appointment of Directors, Powers, duties, & liabilities of Directors, Company Meetings, Resolutions, Winding-up of a Company.

UNIT – II

Law of Contract: Nature of Contract and Essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and Free Consent, Legality of Object. Unlawful and illegal agreements, Contingent Contracts, Performance and discharge of Contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act - 1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

UNIT – III

Negotiable Instruments Act - 1881: Negotiable Instruments- Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics, Types of endorsements, Holder- Holder in due course, Discharge of Parties. Introduction to Goods and Services Tax (GST)

UNIT – IV

Business Ethics: The Changing Environment: Business Ethics-why does it matter? ; Levels of Business Ethics-Five Myths about Business Ethics-can Business Ethics be taught and trained? Stages of Moral development Kohlberg's study-carol Gilligan's Theory-Principles of Ethics.

UNIT – V

Cyber Crime: The Legal Landscape - Need for cyber laws in the Indian context - The Indian IT Act Challenges to Indian Law and cyber crime scenario in Indian – issues and Challenges

in Cyber Crime.

TEXT BOOKS:

1. Ravinder Kumar, Legal Aspects of Business, 4e, Cengage Learning, 2016.
2. P.P.S. Gogna, Company Law, S. Chand, 2016.

REFERENCE BOOKS:

1. RSN Pillai, Bagavathi, Legal Aspects of Business, S. Chand, 2016.
2. Akhileshwar Pathak , Legal Aspects of Business, Tata McGraw Hill, 3e, 2011.
3. Nina Godbole & Sunit Belapure, Cyber Security, Wiley India, 2012.

21BU3261 - FINANCIAL MODELING
Open Elective – II

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Course Objectives:

- 1) Its general objective is to develop spreadsheet and management skills for creating computer-based models in financial modelling process.
- 2) The course helps in analyzing a variety of decision problems facing today's financial managers and professionals.
- 3) To know about fixation of optimal financial structure for business development.
- 4) The course concept is covered with the help of case studies and simulation with real market data.
- 5) To analyze benefits and challenges of Risk modelling

Course Outcomes:

1. Understand basic concepts of Financial Statement Analysis, Cash flows and Valuation Modelling.
2. Understand and analyze Corporate Finance Models
3. Understand various portfolio models
4. Analyze risk modelling and Visual Basic For Application
5. Analyze the simulation techniques in risk modelling.

UNIT -I

Financial Statement Analysis, Cash flows and Valuation Modelling: Income statement Analysis, Balance sheet Analysis, Cash flow Statement Analysis and Forecasting, Terminal value Calculations-the use of fade periods, the return on capital, and valuation of a perpetuity, sensitivity analysis-long term growth and economic profit assumption.

UNIT - II

Corporate Finance Models: Basic financial calculation - PV, NPV, IRR, MIRR, and Flat payment schedules, Cost of Capital- Cost of Equity, Cost of Debt, and WACC.

UNIT – III

Dividend Decisions theories-Walters Model-Gordon Model, Miller -Modigliani theories-Effect of Dividend policy on Share value of firm- Valuation of Firm, Security Market line, CAPM.

UNIT - IV

Portfolio Models: Introduction, portfolio mean and variance, efficient portfolios, capital market line, SML, Variance-covariance Matrix, Convertibility, MBA/CMO and other bonds-Convertible bonds, Mortgage Based Securities, CMO- Collaterized Mortgage Obligation, Managing a CMO Portfolio.

UNIT – V

Risk Modelling: Benefits and challenges of risk modelling, the risk modelling process, Introduction to Simulation Techniques, Value at Risk-Delta Normal Methodology, Historical Simulation Methodology, Monte Carlo Simulation Methodology, and Extreme Value Theory.

Visual Basic for Application: User defined function with VBA, Using Excell functions in VBA, Types and Loops, Macros and users interaction, Arrays, Objects and Add-Ins.

TEXT BOOKS

1. Michael Rees: Financial Modelling in practice-A concise guide for intermediate and advance level, Willey a John Wiley and sons Ltd. Publication, 2008.
2. Simon Benninga: Financial Modelling, 3/e, the MIT Press London, 2008.

REFERENCE BOOK:

1. Thomas S.Y.Ho and Sang Bin Lee: The Oxford guide to Financial Modelling-Application for capital markets, corporate finance, Risk Management and financial Institutions, Oxford University Press, 2004.

21BU3262 – BLOCK CHAIN TECHNOLOGY
Open Elective – II

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Prerequisites

- Knowledge in security and applied cryptography;
- Knowledge in distributed databases

Course Objectives:

1. To Introduce block chain technology and Crypto currency
2. To give exposure on Block chain concepts
3. Provide knowledge on Block chain Science
4. To know types of Digital Currency
5. Provide knowledge on technical challenges in Block chain implementation

Course Outcomes:

1. Learn about Block chain technology and Crypto currency.
2. Understand Extensibility of Blockchain concepts
3. Understand and Analyse Block chain Science
4. Understand various Crypto Currency transaction strategies
5. Understand Technical challenges, Business model challenges

UNIT - I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowdfunding

UNIT - II

Extensibility of Blockchain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Blockchain Environment

UNIT - III

Blockchain Science: Gridcoin, Folding coin, Blockchain Genomics, Bitcoin MOOCs

UNIT - IV

Currency, Token, Tokenizing, Campuscoin, Coindrop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

UNIT - V

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations

TEXT BOOK:

1. Melanie Swan, Blockchain Blueprint for Economy, O'reilly.

REFERENCE BOOKS:

Building Blockchain Apps, Michael Juntao Yuan, Pearson Education
Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition
Bradley Lakerman, Blockchain Revolution: Understanding the Crypto Economy of the Future. A Non-Technical Guide to the Basics of Cryptocurrency Trading and Investing, ISBN: 1393889158.

21BU4161 -MARKETING MANAGEMENT AND RESEARCH

Open Elective – III

B.Tech. IV Year I Sem.

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Course Objectives:

1. To understand the scope of marketing, philosophies and environment.
2. To analyze various marketing opportunities and product development.
3. To analyze markets and design customer driven strategies.
4. To communicate the decisions towards business development with superior customer value.
5. To understand the Product Research and Promotional Research for the Test Marketing.

Course Outcomes:

1. The students will be able to understand the scope of marketing, philosophies and environment.
2. The students will be able to analyze various marketing opportunities and product development.
3. The students will be able to analyze markets and design customer driven strategies.
4. The students will be able to communicate the decisions towards business development with superior customer value.
5. The students will be able to understand the Product Research and Promotional Research for the Test Marketing

UNIT – I:

Introduction to Marketing and Market Research: Importance and scope of Marketing, Core Marketing Concepts, Marketing Philosophies, Marketing Environment, Marketing Strategies & Plans, Changing Marketing landscape

UNIT – II:

Analyzing Marketing Opportunities, Customer Value and Marketing Mix: Consumer, Decision Making, Building Customer Value, Analyzing Consumer Markets – Consumer Behavior –Cultural, Social & Personal Factors, developing products & brands – product levels; classifying products, product range, product line & product mix, Product Life Cycles, new product development., New Service Development, Stages of Product/ Service innovation development, The process of adoption, Branding.

UNIT – III:

Designing a Customer Driven Strategy: Market segmentation - STP Process -segmentation of consumer market, business market, requirement for effective segmentation, Market Targeting – evaluating market segmentation, selecting target market segmentation, positioning –Positioning and repositioning positioning maps, product positioning strategies.

UNIT – IV:

Marketing Research: Introduction, Management uses of marketing research design, Types of Marketing Research and Significance, Marketing Research Process, Problem Formulation & steps in decision Making Process, Marketing Information systems.

UNIT – V:

Marketing Research & Ethics, International Marketing Research, Product Research, Advertising Research, Copy Testing, Test Marketing, Media Selection, Research Report.

TEXTBOOKS:

1. Philip Kotler, Gray Armstrong, Principles of Marketing, 15e, Pearson Education, 2016.
2. Marketing Research- Text and Cases Harper W. Boyd Jr., Ralph Westfall

REFERENCE BOOKS:

1. Lamb, Hair, Sharma, Mc Daniel, Principles of Marketing, A South Asian Perspective Cengage Learning, 2016.
2. Paul Baines, Chris Fill, Kelly Page, Piyush Sinha, Marketing, Asian Edition, Oxford University Press, 2015.
3. Arun Kumar & N. Meenakshi, Marketing Management, Vikas, 2012
4. Rajan Saxena, Marketing Management, 3e, Tata Mc Graw Hill, 2012.
5. Kenneth E Clow, Donald Baack, Cases in Marketing Management, Sage South Asia edition, 2012.
6. Research for Marketing Decisions Paul E. Green, Donald S. Tull

21BU4162 - CLOUD COMPUTING

Open Elective – III

B.Tech. IV Year I Sem

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Pre-Requisites: courses on Computer Networks, Operating Systems, Distributed Systems.

Course Objectives:

1. To explain the evolving computer model called cloud computing.
2. To Understand the current trend and basics of cloud computing
3. To introduce the various levels of services that can be achieved by cloud.
4. To describe the security aspects in cloud.
5. To Learn cloud enabling technologies and its applications

Course Outcomes:

1. Ability to understand various service delivery models of a cloud computing architecture.
2. Ability to understand the virtualization and cloud computing concepts.
3. Able to understand cloud computing architecture and managing cloud infrastructure and its applications.
4. Acquire knowledge on cloud service models.
5. Acquire knowledge on cloud service providers.

UNIT - I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT - II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

UNIT - III

Cloud Computing Architecture and Management: Cloud architecture, Layer,

Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT - IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue Service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP LaBU, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform

TEXT BOOK:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

REFERENCE BOOKS:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

**21CY3161: Introduction to Cyber Security
(Open Elective-I)**

B.Tech. III Year I Sem.

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Prerequisites: Course on Computer Networks.

Course objectives:

- To understand various types of cyber-attacks and cyber-crimes
- To understand intrusion detection system
- To learn threats and risks within context of the cyber security
- To have an overview of the cyber laws & concepts of cyber forensics
- To study the defensive techniques against these attacks

Course Outcomes:

- Analyze and evaluate the cyber security needs of an organization.
- Understand Cyber Security Regulations and Roles of International Law and Learn, analyze and validate Forensics Data
- Understand web threats, security and privacy implications of an organization.
- Design and develop a security architecture for an organization.
- Understand fundamental concepts of data privacy attacks and policies.

Unit I:

Introduction to Cyber Security:

Introduction to Cyber Space, Introduction to Information Systems, Need for Cyber Security

Cyber Attacks:

Introduction to Cyber Attacks, Classification of Cyber Attacks, Classification of Malware, Threats, Vulnerability Assessment.

Unit II:

Cyberspace and the Law & Cyber Forensics:

Intrusion Detection Systems, Intrusion Prevention Systems, Introduction to User Authentication Methods, Biometric Authentication Methods, Biometric Systems.

Cyber Law-Basics:

Cyber Law-Basics, Information Technology Act 2000, Amendments to IT Act 2000.

Unit III:

Security Models and Security Mechanisms:

Different Security Models and Security Mechanisms, Information Security and Network Security, Operating System Security, Web Security, Email Security, Mobile Device Security, Cloud Security, IoT Security, Cyber Physical System Security, Social Media Security, Virtual Currency, Block Chain Technology, Security Auditing.

Unit IV:

Cyber Crimes:

Introduction to Cyber Crimes, Different Types of Cyber Crimes, Scams and Frauds, Analysis of Crimes, Human Behavior, Stylometry, Incident Handling, Investigation Methods, Criminal Profiling, Cyber Trails.

Unit V:

Digital Forensics: Digital Forensics, History, Challenges, Branches of Digital Forensics, Digital

Forensic Investigation Methods, Reporting, Management of Evidence

Note: A Value Added Program (VAP) to be offered in the same area through MOOCS*

SUGGESTED BOOKS AND REFERENCES

1. **Cyber Security- Understanding Cyber Crimes Computer Forensics and Legal Perspectives** by Nina Godbole and Sunit Belapure [Units-I/II/III/IV]
2. **Computer security principles and practices** - William Stallings and Lawrie Brown[Units-I/II/IV/V]
3. **Principles of information security** – Michael[Unit-I]
4. **Incident Response & Computer forensics** - Jason Luttgens, Mathew Pepe and Kevin Mandia[Unit-IV]
5. **Digital forensics for Legal Professionals: Understanding Digital Evidence from the Warrant to the Courtroom** - Lars E. Daniel and Paul R. Reddy[Unit-V]

Web references:

1. https://heimdalsecurity.com/pdf/cyber_security_for_beginners_ebook.pdf
2. <http://larose.staff.ub.ac.id/files/2011/12/Cyber-Criminology-Exploring-Internet-Crimes-and-Criminal-Behavior.pdf>
3. <http://docshare04.docshare.tips/files/21900/219006870.pdf>
4. <http://index-of.co.uk/Hacking-Colecion/Insider%20Attack%20&%20Cyber%20Security%20-%20Beyond%20the%20Hacker.pdf>
5. <http://www.uou.ac.in/sites/default/files/slm/FCS.pdf>
6. https://cyber-cops.com/book_detail

21CY3162: Cyber Laws-IT Act 2000
(Open Elective-I)

B.Tech. III Year I Sem.

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Course Objectives:

- To understand the significance of cyber laws and different acts.
- Make Learner Conversant with The Social and Intellectual Property Issues Emerging from 'Cyberspace.
- Explore The Legal and Policy Developments in Various Countries to Regulate Cyberspace.
- Develop The Understanding of Relationship Between Commerce and Cyberspace.
- Give Learners in Depth Knowledge of Information Technology Act and Legal Frame Work Of Right To Privacy, Data Security And Data Protection.

Course Outcomes:

- Understand the need of cyber laws.
- Understand the important provisions of the act
- Understanding the significance of digital signatures.
- Analyze regulatory authorities in cyber law.
- Overview of cybercrime and procedure to report cybercrime.

UNIT - I

Introduction: History of Internet and World Wide Web, need for cyber law, Cybercrime on the rise, important terms related to cyber law.

Cyber law in India: Need for cyber law in India, History of cyber law in India, Information Technology Act, 2000, Overview of other laws amended by the IT Act, 2000, State Emblem of India (Prevention of Improper Use) Act 2005, National Policy on Information Technology 2012.

UNIT - II

Overview of The Information Technology Act, 2000: Applicability of the Act, Important provisions of the Act: Digital signature and Electronic signature, Digital Signature under the IT Act, 2000, EGovernance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries, Defusion of cybercrimes, Defusion of Cyber Criminal Legacy.

UNIT - III

Overview of Rules Issued Under the IT Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds, Cyberpolicing.

UNIT - IV

Regulatory Authorities: Department of Electronics and Information Technology, Controller of Certifying Authorities (CCA), Cyber Appellate Tribuna, Indian Computer Emergency Response Team (ICERT), Cloud Computing, Case Laws.

UNIT - V

Introduction to Cybercrime and Procedure to Report Cybercrime: Procedure to Report Cyber Crime, Some Basic Rules for Safe Operations of the Computer and Internet, The Criminal Law (Amendment) Act, 2013: Legislative Remedies For Online Harassment And Cyber stalking In India.

TEXT BOOKS:

1. Pavan Duggal, Textbook On Cyber Law, second edition, Universal Law.
2. Pavan Duggal, Indian Cyberlaw On Cyber Crimes.

REFERENCE BOOKS:

1. Debby Russell and Sr. G.T. Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John blackley, "Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996.
5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997.
6. James Graham, "Cyber Security Essentials" Averbach Publication T & F Group.
7. PGF Cyberpolicing to Defuse Fake Government of Telangana (FGoT), Fake Government of India (FGoI) and Cybercriminal Legacy, Page.no 181-191, ISBN 978-981-16-3659-2.

21CY3263: Introduction to Ethical Hacking
(Open Elective-II)

B.Tech. III Year II Sem.

L T P C
3 - - 3

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes- Impacts of Hacking; Types of Hackers; Information Security Models;
- Information Security Program; Business Perspective; Planning a Controlled Attack; Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration).

Course Outcomes:

- Gain the knowledge of the use and availability of tools to support an ethical hack.
- Gain the knowledge of interpreting the results of a controlled attack.
- Understand the role of politics, inherent and imposed limitations and metrics for planning of a test.
- Comprehend the dangers associated with penetration testing.

UNIT- I

Introduction: Hacking Impacts, The Hacker

Framework: Planning the test, Sound Operations, Reconnaissance, Enumeration, Vulnerability

Analysis, Exploitation, Final Analysis, Deliverable, Integration. Information Security Models: Computer Security, Network Security, Service Security, Application Security, Security Architecture. **Information Security Program:** The Process of Information Security, Component Parts of Information Security Program, Risk Analysis and Ethical Hacking.

UNIT - II

The Business Perspective: Business Objectives, Security Policy, Previous Test Results, Business Challenges. **Planning for a Controlled Attack:** Inherent Limitations, Imposed Limitations, timing is Everything, Attack Type, Source Point, Required Knowledge, Multi-Phased Attacks, Teaming and Attack Structure, Engagement Planner, The Right Security Consultant, The Tester, Logistics, Intermediates, Law Enforcement.

UNIT - III

Preparing for a Hack: Technical Preparation, Managing the Engagement. Reconnaissance: Social Engineering, Physical Security, Internet Reconnaissance.

UNIT - IV

Enumeration: Enumeration Techniques, Soft Objective, Looking Around or Attack, Elements of Enumeration, Preparing for the Next Phase. **Exploitation:** Intuitive Testing, Evasion, Threads and Groups, Operating Systems, Password Crackers, RootKits, applications, Wardialing, Network, Services and Areas of Concern.

UNIT - V

Deliverable: The Deliverable, The Document, Overall Structure, Aligning Findings, Presentation. **Integration:** Integrating the Results, Integration Summary, Mitigation, Defense Planning, Incident Management, Security Policy, Conclusion.

TEXT BOOK:

1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.

REFERENCE BOOKS:

1. EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning.
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning.

**21CY3264: Introduction to Digital Forensics
(Open Elective-II)**

B.Tech. III Year II Sem.

**L T P C
3 - - 3**

Course Objective

- To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices.
- To understand how to examine digital evidences such as the data acquisition, identification analysis.

Course Outcomes

- Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
- To be well-trained as next-generation computer crime investigators.
- Knowledge on Forensics acquisition tools.
- Knowledge on Processing crimes and Scenes.
- Knowledge on validating and testing forensic software's.

UNIT -I

Computer Forensics Fundamentals, Benefits of Forensics, Computer Crimes, Computer Forensics Evidence and Courts, Legal Concerns and Private issues.

UNIT- II

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

UNIT-III

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

UNIT-IV

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

UNIT-V

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, e-mail investigations- investigating email crime and violations, understanding e-mail servers, specialized e-mail forensics tool.

TEXT BOOKS:

1. Warren G. Kruse II and Jay G. Heiser, “Computer Forensics: Incident Response Essentials”, Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., “Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

REFERENCES:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

**21CY4161: Social Media Security Essentials
(Open Elective-III)**

B.Tech. IV Year I Sem.

**L T P C
3 - - 3**

Course Objectives: Give introduction about the social networks, its use, the need of security in social data.

Course Outcomes:

1. Learn about browser's risks.
2. Learn about Social Networking, Understand the risks while using social media. Guidelines for social networking.
3. Understand how to secure different web browsers.
4. Understand how an e-mail works, learn threats involved using an email communication, safety measures while using e-mail.

UNIT – I

Introduction to Social Media, Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good With the Bad.

UNIT - II

Dark side Cybercrime, Social Engineering, Hacked accounts, cyberstalking, cyberbullying, predators, phishing, hackers.

UNIT – III

Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, Sometimes it's better to be overlooked, Social media hoaxes, The human factor, Content management, Promotion of social media.

UNIT - IV

Risks of Social media Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment.

UNIT – V

Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing.

TEXT BOOKS:

1. Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics, Authors: Altshuler Y, Elovici Y, Cremers A.B, Aharony N, Pentland A. (Eds.).
2. Social media security
<https://www.sciencedirect.com/science/article/pii/B97815974998660000>

REFERENCE BOOKS:

1. Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk.
2. Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press.

**21CY4162: Fundamentals of Security Incident & Response Management
(Open Elective-III)**

B.Tech. IV Year I Sem.

**L T P C
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Prerequisites:

- Knowledge in information security and applied cryptography.
- Knowledge in Operating Systems.

Course Objectives:

1. Introduce preparation of inevitable incident and incident detection and characterization.
2. To get an exposure to live data collection, Forensic duplication.
3. To gain knowledge on data analysis including Windows and Mac OS Systems.

Course Outcomes:

1. Learn how to handle the incident response management.
2. Perform live data collection and forensic duplication.
3. Identify network evidence.
4. Analyze data to carry out investigation.

UNIT - I

Introduction: Preparing for the Inevitable incident: Real world incident, IR management incident handbook, Pre-incident preparation, Preparing the Organization for Incident Response, Preparing the IR team, Preparing the Infrastructure for Incident Response. Incident Detection and Characterization: Getting the investigation started on the right foot, collecting initial facts, Maintenance of Case Notes, Understanding Investigative Priorities. Discovering the scope of incident: Examining initial data, Gathering and reviewing preliminary evidence, determining a course of action, Customer data loss scenario, Automated clearing fraud scenario.

UNIT - II

Data Collection: Live Data Collection: When to perform live response, Selecting a live response tool, what to collect, collection best practices, Live data collection on Microsoft Windows Systems, Live Data Collection on Unix-Based Systems. Forensic Duplication: Forensic Image Formats, Traditional duplication, Live system duplication, Duplication of Enterprise Assets.

UNIT - III

Network Evidence: The case for network monitoring, Types for network monitoring, Setting Up a Network Monitoring System, Network Data, Analysis, Collect Logs Generated from Network Events. Enterprise Services: Network Infrastructure Services, Enterprise Management Applications, Webservers, Database Servers

UNIT - IV

Data Analysis: Analysis Methodology: Define Objectives, Know your data, Access your data, Analyse your data, Evaluate Results. Investigating Windows Systems: NTFS and File System analysis, Prefetch, Event logs, Scheduled Tasks, The Windows Registry, Other Artifacts of Interactive Sessions, Memory Forensics, Alternative Persistence Mechanisms.

UNIT - V

Investigating Mac OS X Systems: HFS+ and File System Analysis, Core Operating systems data. Investigating Applications: What is Application Data?, Where is application data stored?, General Investigation methods, Web Browser, Email Clients, Instant Message Clients.

TEXT BOOKS:

1. "Incident Response and Computer Forensics", Jason T. Luttgens, Mathew Pepe and Kevin Mandia, 3rd Edition, Tata McGraw-Hill Education.
2. "Cyber Security Incident Response-How to Contain, Eradicate, and Recover from Incidents", Eric. C. Thompson, Apress.

REFERENCE BOOKS:

1. "The Computer Incident Response Planning Handbook: Executable Plans for Protecting Information at Risk", N.K. McCarthy, Tata McGraw-Hill.

**21AM3261: NEURAL NETWORKS AND DEEP LEARNING
(Open Elective - II)**

B.Tech. III Year II Sem

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Course Objectives:

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies

Course Outcomes:

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and

Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition,
Natural Language Processing

TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

21AM3262: REINFORCEMENT LEARNING
(Open Elective - II)

B.Tech. III Year II Sem.

L T P C

3 - -3

Prerequisites :Linear algebra

1. Real analysis and calculus
2. Probability
3. Machine Learning
4. Artificial Intelligence

Course Objectives: The course will explain in depth:

1. Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks.
2. Formalize problems as Markov Decision Processes and bellman equations
3. Knowledge on value functions, as a general-purpose tool for optimal decision-making
4. How to implement dynamic programming as an efficient solution approach to an industrial control problem
5. Characterize and differentiate between different fundamental approaches to Reinforcement Learning.

Course Outcomes: At the end of the course student will be able to:

1. Understand basics of RL tasks and the core principles behind the RL, including policies, value functions.
2. Understand RL Framework and Markov Decision-Process, deriving Bellman equations.
3. Analyze the use of Dynamic Programming and Monte Carlo.
4. Understand Bootstrapping and Temporal-Difference learning methods (TD(0), SARSA, Q-Learning)
5. Understand TD(λ) algorithm, policy-based methods and implement Case Studies.

UNIT-I

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sublinear regret, UCB algorithm, KL-UCB, Thompson Sampling.

UNIT-II

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

UNIT-III

The Reinforcement Learning problem, prediction and control problems, Model-based algorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

UNIT-IV

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

UNIT-V

n-step returns; TD(λ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD(λ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

TEXT BOOKS:

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition, Sugiyama, Masashi. CRC Press 2015.

REFERENCE BOOKS:

1. "Bandit algorithms," First Edition, Lattimore, T. and C.Szepesvári. Cambridge University Press. 2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brand on Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

21AM4161: SOFT COMPUTING

(Open Elective –III)

B.Tech. IV Year I Sem.

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Course objectives:

1. To make the student to understand the role of imprecision and uncertainty in real world scenarios.
2. To explain the role of Soft Computing in addressing the imprecision and uncertainty.
3. To explain the principal components of soft computing that include Fuzzy Sets and Fuzzy Logic, Artificial Neural Networks, Genetic Algorithms and Rough Sets.
4. To learn the Design and Implementation of Soft Computing methodologies.
5. To explain the design of hybrid systems which is combination of one or more soft computing methodologies mentioned.

Course outcomes:

1. Ability to represent Uncertainty / imprecision data.
2. Ability to select a suitable method of Soft Computing to solve a particular problem.
3. Ability to build hybrid systems using Soft Computing techniques.

UNIT I

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TEXT BOOKS:

1. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd.,

2nd Edition, 2011.

2. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

REFERENCES

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, —Neuro-Fuzzy and Soft Computing, Prentice-Hall of India, 2002.
2. Kwang H.Lee, —First course on Fuzzy Theory and Applications, Springer, 2005.
3. George J. Klir and Bo Yuan, —Fuzzy Sets and Fuzzy Logic-Theory and Applications, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, —Neural Networks Algorithms, Applications, and Programming Techniques, Addison Wesley, 2003.

21AM4162: NATURAL LANGUAGE PROCESSING

(Open Elective –III)

B.Tech. IV Year I Sem.

L T P C
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Prerequisites:

1. **Proficiency in Python**
2. **Calculus, Linear Algebra**
3. **Basic Probability and Statistics.**
4. **Foundations of Machine Learning**
5. Knowledge on Neural Networks and Deep Learning.

Course Objectives:

1. The concepts and techniques of Natural language Processing for analyzing words based on Morphology and Corpus.
2. How to Apply mathematical foundations ,statistical learning methods and probability theory with linguistic essentials such as syntactic and semantic analysis of text.
3. How to Analyze the syntax ,Semantics and Pragmatics of a sentence and Discourse of a paragraph or a document written in natural language.
4. How to Extract information from text automatically using concepts and methods from Natural Language Processing including stemming,n-grams,POS Tagging and Parsing
5. How to Apply Machine Learning and Deep Learning Algorithms to Natural Language Processing
6. How to build applications to carry out Natural Language Processing using libraries such as NLTK,RE,spaCY.

Course Outcomes:

1. Understand the structure of words and documents,Linguistic resources
2. Understand and apply approaches to syntax analysis in NLP
3. **Understand and Apply** approaches to semantics analysis in NLP
4. **Understand and Apply Algorithms for Discourse and Apply Language Models for Word Predictions.**
5. Understand Machine Learning and Deep Learning techniques used in NLP and Apply Recurrent Neural Networks (RNNs) for large scale word predictions.

UNIT I

Introduction to NLP - Introduction and applications, NLP Terminology, NLP phases, Issues and challenges in understanding Natural Language Text; **Word Analysis**- Morphological Parsing, word2Vec,Typology,**Structure of Documents**: Sentence Boundary and Topic Boundary Detection.

Linguistic Resources-Treebank Corpus, Prop Bank Corpus, Verb Net, WordNet

UNIT II

Syntax Analysis:

Parts-of-speech Tagging: Rule based and TBL,POS tagging using Hidden Markov Model,

Introduction to POS Tagging using Neural Model

Parsing: Top Down and Bottom up parsing.

Syntactic Parsing: CKY parsing, Earley Parsing

Statistical Parsing: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs.

Dependency Parsing: Shift Reduce Parsing, MST Based Dependency Parsing

UNIT III

Semantic Parsing: Terminology, Challenges in semantic Interpretation, Predicate- Argument Structure-Semantic Role Labelling; **Meaning Representation-** Approaches, Need, Abstract Meaning Representation using Frameset.

Word Sense Disambiguation: Sense Ambiguity; **Knowledge Based Approach:** Lesk's Algorithm, Walkers Algorithm, Random Walk Algorithm; **Supervised Approach:** Decision List, Bayesian Classification; **Unsupervised Approach:** Hyper Lex Algorithm

UNIT IV

Discourse Processing: Cohesion, Reference Resolution, Discourse Cohesion and Structure, Hobb's Algorithm for pronoun resolution.

Embedding's from prediction: Skip-gram and CBOW

Language Modelling: Introduction, N-Gram Models, N Gram Smoothing, Multi and Cross Lingual Modeling.

UNIT V

NLP with Deep Learning:

Recurrent Neural Network: why RNNs are needed, RNN Forward and Backward Propagation, Problems with RNN.

Long Short Term Memory: Next Word predictor using LSTM, Bidirectional RNN ,BiLSTM, Introduction to Large Language Models

Text books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary

3. Deep Learning for Natural Language Processing by Palash Goyal, Sumit Pandey, Karan Jain, and Karan Nagpal

Reference books: 1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.

2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT press, 1999

3. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

21DS3161: DATA SCIENCE FOR BEGINNERS
(Open Elective – I)

B.Tech. III Year I Sem

Course Objectives

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1. To learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
2. To exploring data analysis, predictive modeling, descriptive modeling, data product creation, evaluation, and effective communication
3. To understand the basic knowledge of algorithms and reasonable programming experience and some familiarity with basic linear algebra and basic probability and statistics
4. To identify the importance of recommendation systems and data visualization techniques

Course Outcomes

1. Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data
2. Discuss the significance of exploratory data analysis (EDA) in data science and to apply basic tools (plots, graphs, summary statistics) to carry out EDA
3. Apply basic machine learning algorithms and to identify common approaches used for Feature Generation
4. Analyze fundamental mathematical and algorithmic ingredients that constitute a Recommendation Engine and to Build their own recommendation system using existing components

UNIT I:

Introduction: What is Data Science? - Big Data and Data Science hype – and getting past the hype - Why now? – Datafication - Current landscape of perspectives - Skill sets needed - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model - Intro to R

UNIT II:

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA - Philosophy of EDA - The Data Science Process - Case Study: Real Direct (online real estate firm) - Three Basic Machine Learning Algorithms, Linear Regression - k-Nearest Neighbors (k-NN) - k-means

UNIT III:

One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam - Why Linear Regression and k-NN are poor choices for Filtering Spam - Naive Bayes and why it works for Filtering Spam

UNIT IV:

Data Wrangling: APIs and other tools for scrapping the Web - Feature Generation and Feature Selection (Extracting Meaning From Data) - Motivating application: user (customer)

retention - Feature Generation (brainstorming, role of domain expertise, and place for imagination) - Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests

UNIT V:

Data Visualization - Basic principles, ideas and tools for data visualization 3 - Examples of inspiring (industry) projects - Exercise: create your own visualization of a complex dataset -

Data Science and Ethical Issues - Discussions on privacy, security, ethics - A look back at Data Science - Next-generation data scientists

TEXT BOOKS:

1. Doing Data Science, Straight Talk From The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly, 2014
2. Mining of Massive Datasets v2.1, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, Cambridge University Press, 2014
3. Machine Learning: A Probabilistic Perspective, Kevin P. Murphy, 2013 (ISBN 0262018020)

REFERENCE BOOKS:

1. Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, 2nd Edition, 2009 (ISBN 0387952845)
2. Foundations of Data Science, Avrim Blum, John Hopcroft and Ravindran Kannan
3. Data Mining and Analysis: Fundamental Concepts and Algorithms, Mohammed J. Zaki and Wagner Miera Jr. Cambridge University Press, 2014
4. Data Mining: Concepts and Techniques, Jiawei Han, Micheline Kamber and Jian Pei, 3rd Edition, 2011 (ISBN 0123814790)

21DS3162: R PROGRAMMING

(Open Elective – I)

B.Tech. III Year I Sem

Course Objectives:

L	T	P	C
3	-	-	3

1. Understanding and being able to use basic programming concepts
2. Automate data analysis
3. Working collaboratively and openly on code
4. Knowing how to generate dynamic documents
5. Being able to use a continuous test-driven development approach

Course Outcomes:

1. Understand to use and program in the programming language R
2. Understand to use R to solve statistical problems
3. Implement and describe Monte Carlo the technology
4. Implement minimize and maximize functions using R

UNIT – I

Introduction: Overview of R, R data types and objects, reading and writing data, sub setting, R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations.

UNIT – II

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes, Vectors: Generating sequences, Vectors and subUcripts, Extracting elements of a vector using subUcripts, Working with logical subUcripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.

UNIT – III

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List, Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List, Components and Values Applying Functions to Lists, DATA FRAMES, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

UNIT - IV

Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, Extracting a Subtable, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions.

UNIT - V

Graphics: Creating Graphs, Customizing Graphs, Saving Graphs to Files, Customizing Graphs, Creating Three-Dimensional Plots.

Debugging: Fundamental Principles of Debugging, Why Use a Debugging Tool?, Using R Debugging Facilities, Moving Up in the World: More Convenient Debugging Tools, Ensuring Consistency in Debugging Simulation Code, Syntax and Runtime Errors, Running GDB on R Itself.

TEXT BOOKS:

1. R Programming for Data Science by Roger D. Peng
2. The Art of R Programming by Norman Matloff Cengage Learning India.

REFERENCE BOOKS:

1. Hadley Wickham, Garrett Golemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition, O'Reilly.
2. Tilman M. Davies, The book of R a first course in programming and statistics, no starch press.

21DS3263: KNOWLEDGE DISCOVERY TECHNIQUES

(Open Elective – II)

B.Tech. III Year II Sem

L	T	P	C
3	-	-	3

Pre-Requisites:

1. A course on “Database Management Systems”
2. Knowledge of probability and statistics

Course Objectives:

1. Examine the types of the data to be mined and apply pre-processing methods on raw data.
2. To introduce the basic concepts of Data Warehouse and Data Mining techniques.
3. Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.
4. Prepare students for research in the area of data mining and related applications and Enhance students communication and problem solving skills.
5. Provide the students with practice on applying data mining solutions using common data mining software tool /programming languages.

Course Outcomes:

1. Describe the fundamentals of data mining systems as well as issues related to access and retrieval of data at scale.
2. Explain the various data mining functionalities and data warehousing techniques.
3. Apply the various data mining techniques to solve classification, clustering and association rule mining problems.
4. Analyze and choose among different approaches of a data mining task.
5. Design and evaluate data mining models to be used in solving real life problems, keeping in view social impacts of data mining

UNIT - I

Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining. **Data Processing:** Data Cleaning, Data Integration and Transformation, Data Reduction..

UNIT - II

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization.

UNIT - III

Mining Association Rules in Large Databases: Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi-Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis.

UNIT - IV

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule Analysis, Other Classification Methods, Prediction, Classification Accuracy.

UNIT - V

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Method - k- Medoids Algorithm, CLARANS, Hierarchical Methods - BIRCH, ROCK Density-Based Methods - DBSCAN, Outlier Analysis.

TEXT BOOKS:

1. Jiawei Han & Micheline Kamber “Data Mining Concepts & Techniques”, Publisher Harcourt India. Private Limited, 3 nd Edition.

REFERENCE BOOK:

1. Gupta G.K. “Introduction to Data Mining with case Studies”, PHI, New Delhi, 2006.
2. Berson A. & Smith S.J. “Data Warehousing Data Mining”, COLAP, TMH, New Delhi, 2004.
3. Dunham H.M. & Sridhar S. “Data Mining”, Pearson Education, New Delhi, 2006.

21DS3264: DATA GUIDED METHODS

(Open Elective – II)

B.Tech. III Year II Sem

L	T	P	C
3	-	-	3

Prerequisites

1. Data Base Management Systems, Computer Oriented Statistical Methods

Course Objectives

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- To develop problem solving abilities using Mathematics
- To apply algorithmic strategies while solving problems

Course Outcomes

1. Identify the various sources of Big Data.
2. Apply several key big data technologies used for storage, analysis and manipulation of data.
3. Design methodologies to extract data from structured and un-structured data for analytics
4. Apply Regression algorithms to perform data analytics.
5. Apply advanced regression and Time series modeling to Discover interesting patterns

UNIT - 1

Data Management: Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data pre-processing, Missing Values - Outlier Detection and Treatment.

UNIT- 2

Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of data and variables, Data Modeling Techniques, Missing imputations etc. Need for Business Modeling.

UNIT - 3

Regression – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc. Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIT - 4

Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, over fitting, Pruning and Complexity, Multiple Decision Trees etc.

Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction.

UNIT - 5

Working with Documents:

Standard Operating Procedures for documentation and knowledge sharing. Defining purpose and scope documents, Understanding structure of documents — case studies, articles, white papers, technical reports etc., Intellectual Property and Copyright, Document preparation too

TEXT BOOKS:

1. Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.
2. Associate Analytics Handbook.

REFERENCES:

3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Millway Labs Jeffrey D Ullman Stanford Univ.
4. Michael Minelli, Michele Chambers, AmbigaDhiraj ,“Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends”, John Wiley & Sons, 2013.
5. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014

21DS4165: SOCIAL MEDIA ANALYTICS

(Open Elective – III)

B.Tech. IV Year I Sem

L	T	P	C
3	-	-	3

Course Objectives: Exposure to various web and social media analytic techniques.

Course Outcomes:

1. Knowledge on decision support systems.
2. Apply natural language processing concepts on text analytics.
3. Understand sentiment analysis.
4. Knowledge on search engine optimization and web analytics.

UNIT - I

An Overview of Business Intelligence, Analytics, and Decision Support: Analytics to Manage a Vaccine Supply Chain Effectively and Safely, Changing Business Environments and Computerized Decision Support, Information Systems Support for Decision Making, The Concept of Decision Support Systems (DSS), Business Analytics Overview, Brief Introduction to Big Data Analytics.

UNIT - II

Text Analytics and Text Mining: Machine Versus Men on Jeopardy!: The Story of Watson, Text Analytics and Text Mining Concepts and Definitions, Natural Language Processing, Text Mining Applications, Text Mining Process, Text Mining Tools.

UNIT - III

Sentiment Analysis: Sentiment Analysis Overview, Sentiment Analysis Applications, Sentiment Analysis Process, Sentiment Analysis and Speech Analytics.

UNIT - IV

Web Analytics, Web Mining: Security First Insurance Deepens Connection with Policyholders, Web Mining Overview, Web Content and Web Structure Mining, Search Engines, Search Engine Optimization, Web Usage Mining (Web Analytics), Web Analytics Maturity Model and Web Analytics Tools.

UNIT - V

Social Analytics and Social Network Analysis: Social Analytics and Social Network Analysis, SocialMedia Definitions and Concepts, Social Media Analytics.

TEXT BOOK:

1. Ramesh Sharda, Dursun Delen, Efraim Turban, BUSINESS INTELLIGENCE AND ANALYTICS: SYSTEMS FOR DECISION SUPPORT, Pearson Education.

REFERENCE BOOKS:

1. Rajiv Sabherwal, Irma Becerra-Fernandez, "Business Intelligence – Practice, Technologies and Management", John Wiley 2011.
2. Lariss T. Moss, ShakuAtre, "Business Intelligence Roadmap", Addison-Wesley It

Service.

3. Yuli Vasiliev, "Oracle Business Intelligence: The Condensed Guide to Analysis and Reporting", SPD Shroff, 2012.

21DS4166: DATA VISUALIZATION USING PYTHON

(Open Elective – III)

B.Tech. IV Year I Sem

Course Objective: To understand various data visualization techniques.

L	T	P	C
3	-	-	3

Course Outcomes:

1. Visualize the objects in different dimensions.
2. Design and process the data for Virtualization.
3. Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical science.
4. Apply the virtualization techniques for research projects. (K1, K3).

UNIT - I

Introduction and Data Foundation: Basics - Relationship between Visualization and Other Fields - The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Preprocessing - Data Sets

UNIT - II

Foundations for Visualization: Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables - Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson's Affordance theory – A Model of Perceptual Processing.

UNIT - III

Visualization Techniques: Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three- Dimensional Data - Dynamic Data - Combining Techniques.

Geospatial Data: Visualizing Spatial Data- Visualization of Point Data -Visualization of Line Data - Visualization of Area Data - Other Issues in Geospatial Data Visualization

Multivariate Data: Point-Based Techniques - Line- Based Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures –Graphics and Networks- Displaying Arbitrary Graphs/Networks.

UNIT - IV

Interaction Concepts and Techniques: Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations - Extended Text Visualizations

Interaction Concepts: Interaction Operators -Interaction Operands and Spaces - A Unified Framework.

Interaction Techniques: Screen Space - Object-Space -Data Space -Attribute Space-Data Structure Space - Visualization Structure - Animating Transformations - Interaction Control.

UNIT - V

Research Directions in Virtualizations: Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation, Hardware and Applications.

TEXT BOOKS:

1. Matthew Ward, Georges Grinstein and Daniel Keim, “Interactive Data Visualization Foundations, Techniques, Applications”, 2010.
2. Colin Ware, “Information Visualization Perception for Design”, 2nd edition, Morgan Kaufmann Publishers, 2004.

REFERENCE BOOKS:

1. Robert Spence “Information visualization – Design for interaction”, Pearson Education, 2nd Edition, 2007.
2. Alexandru C. Telea, “Data Visualization: Principles and Practice,” A. K. Peters Ltd, 2008.