JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

R18 B.TECH. List of Open Electives

Applicable From 2020-21 Admitted Batch

Branch	III Yr II Sem Open Elective (OE – I)	IV Yr I Sem Open Elective (OE – II)	IV Yr II Sem Open Elective (OE – III)
Civil Engineering	Disaster Preparedness & Planning Management	Remote Sensing & GIS	Environmental Impact Assessment
Computer Science & Engineering / Information Technology/ Information Technology and Engineering/ Computer Science and Information Technology	1. Entrepreneurship 2. Fundamentals of Management for Engineers 3. Cyber Law & Ethics	1. Data Structures 2. Artificial Intelligence 3. Python Programming 4. Java Programming	1. Machine Learning 2. Mobile Application Development 3. Scripting Languages 4. Database Management Systems
Computer Science & Engineering (Artificial Intelligence & Machine Learning)	1. Fundamentals of AI 2. Machine Learning Basics	1. AI applications 2. Introduction to Natural Language Processing	1. Chatbots 2. Genetic Algorithms & Fuzzy logic
Computer Science & Engineering (Networks)	1. Game Theory 2. Network Administration	1. 5G Technologies 2. Optimization Techniques	1. Blockchain Technology 2. Real Time Systems
Computer Science and Business Systems	1. Operations Research 2. Cloud Computing	1. Design Thinking 2. Enterprise Resource Planning	1. Innovation IP Management and Entrepreneurship 2. Social Media Analytics
Computer Science & Engineering (Cyber Security)	1. Cyber Laws 2. Ethical Hacking	1. Computer Security & Audit Assurance 2. Social Media Security	1. 5G Technologies 2. Data Privacy
Computer Science & Engineering (Data Science)/ Computer Engineering (Software Engineering)	1. Fundamentals of Data Science 2. R Programming	1. Data Analytics 2. Data Mining	1. Data Visualization using Python 2. Introduction to social media mining
Computer Science & Engineering (Internet of Things)	1. Introduction to IoT 2. IoT sensors	1. IoT Automation 2. AI applications	1. IoT Security 2. Industrial IoT
Electronics and Instrumentation Engineering	Basics of Sensors Technology	Fundamentals of Biomedical Applications	Basics of Virtual Instrumentation

Electronics and Communication Engineering	Fundamentals of Internet of Things	Electronic Sensors	Measuring Instruments
Electrical and Electronics Engineering	1. Reliability Engineering 2. Renewable Energy Sources	1. Utilization of Electrical Energy 2. Electric Drives and Control	1. Basics of Power Plant Engineering 2. Energy Sources and Applications
Mechanical Engineering	Quantitative Analysis for Business Decisions	Basic Mechanical Engineering	Non-Conventional Sources of energy
Aeronautical Engineering	Quantitative Analysis for Business Decisions	Basics of Aeronautical Engineering	Elements of Rocket Propulsion
Mechatronics	1. Industrial Management 2. Non-Conventional Energy Sources	1. Intellectual Property Rights 2. Principles of Entrepreneurship 3. Basic Mechanical Engineering	1. Fundamentals of Robotics 2. Linear and Non-Linear Optimization Techniques 3. Total Quality Management
Petroleum Engineering	General Geology	Natural Gas Engineering	Green Fuel Technologies
Metallurgical and Materials Engineering	1. Testing of Materials 2. Alloy Steels	1. Engineering Materials 2. Surface Engineering	1. High Temperature Materials 2. Light Metals and Alloys
Mining Engineering	1. Introduction to Mining Technology 2. Coal Gasification, CBM & Shale Gas	1. Health & Safety in Mines 2. Material Handling in Mines	1. Solid Fuel Technology 2. Remote Sensing and GIS in Mining

***Note:** Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.

CE600OE: DISASTER PREPAREDNESS & PLANNING MANAGEMENT (Open Elective - I)

B.Tech. Civil Engg. III Year II Sem.	**L**	**T/P/D**	**C**
	3	**0/0/0**	**3**

Course Objectives: The objectives of the course are

- To Understand basic concepts in Disaster Management.
- To Understand Definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters.
- To Understand the Challenges posed by Disasters.
- To understand Impacts of Disasters Key Skills.

Course Outcomes: The student will develop competencies in

- the application of Disaster Concepts to Management.
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters.
- Realization of the responsibilities to society.

UNIT - I:

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT - II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT - III

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT - IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT - V

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.

3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

CE700OE: REMOTE SENSING & GIS (Open Elective - II)

B.Tech. Civil Engg. IV Year I Sem.	**L**	**T/P/D**	**C**
	3	**0/0/0**	**3**

Course Objectives: The objectives of the course are to

- Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images
- know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
- Understand the students managing the spatial Data Using GIS.
- Understand Implementation of GIS interface for practical usage.

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

- **Describe** different concepts and terms used in Remote Sensing and its data
- Understand the Data conversion and Process in different coordinate systems of GIS interface
- **Evaluate** the accuracy of Data and implementing a GIS
- **Understand the applicability** of RS and GIS for various applications

UNIT – I

Concepts of Remote Sensing Basics of remote sensing- elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

UNIT- II:

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Co-ordinate systems, Map projections, Map transformation, Geo-referencing,

UNIT- III:

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization

Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata,

UNIT- IV:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS.

Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques

UNIT- V: Implementing a GIS and Applications

Implementing a GIS: Awareness, developing system requirements, evaluation of alternative systems, decision making using GIS

Applications of GIS

GIS based road network planning, Mineral mapping using GIS, Shortest path detection using GIS, Hazard Zonation using remote sensing and GIS, GIS for solving multi criteria problems, GIS for business applications.

TEXT BOOKS

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education (Indian Edition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley Publishers, 2012.

REFERENCE BOOKS

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers, 7th Edition, 2015.\
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition, 2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar, N. Madhu, Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy,

CE800OE: ENVIRONMENTAL IMPACT ASSESSMENT (Open Elective - III)

B.Tech. Civil Engg. IV Year II Sem.	L	T/P/D	C
	3	0/0/0	3

Course Objectives: The objectives of the course are to

- **Define and Classify** Environmental Impacts and the terminology
- **Understands** the environmental Impact assessment procedure
- **Explain** the EIA methodology
- **List and describe** environmental audits

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

- Identify the environmental attributes to be considered for the EIA study
- Formulate objectives of the EIA studies
- Identify the methodology to prepare rapid EIA
- Prepare EIA reports and environmental management plans

UNIT- I

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance, Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules.
Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

CS600OE: ENTREPRENEURSHIP (Open Elective – I)

B.Tech. CSE/IT/ITE/CSIT III Year II Sem	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objective: The aim of this course is to have a comprehensive perspective of inclusive learning, ability to learn and implement the Fundamentals of Entrepreneurship.

Course Outcome: It enables students to learn the basics of Entrepreneurship and entrepreneurial development which will help them to provide vision for their own Start-up.

UNIT – I

Entrepreneurial Perspectives

Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT - II

New Venture Creation

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT – III

Management of MSMEs and Sick Enterprises

Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

UNIT – IV

Managing Marketing and Growth of Enterprises

Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT – V

Strategic perspectives in Entrepreneurship

Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

TEXT BOOKS:

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T. V. Rao, 3e, Cengage, 2012.
3. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.
4. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.

CS601OE: FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS (Open Elective – I)

B.Tech. CSE/IT/ITE/CSIT III Year II Sem

L	T	P	C
3	0	0	3

Course Objective: To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

Course Outcome: The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

UNIT - I

Introduction to Management: Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process-Types of Plans-MBO

UNIT - II

Organization Structure & HRM: Organization Design-Organizational Structure-Departmentation–Delegation-Centralization - Decentralization-Recentralization-Organizational Culture- Organizational climate- Organizational change

Human Resource Management-HR Planning - Recruitment & Selection - Training & Development-Performance appraisal - Job Satisfaction-Stress Management Practices

UNIT - III

Operation Management: Introduction to Operations Management-Principles and Types of Plant Layout-Methods of production (Job Batch and Mass production) - Method study and Work Measurement-Quality Management - TQM-Six sigma - Deming's Contribution to Quality - Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re-engineering (BPR)

UNIT - IV

Marketing Management: Introduction to Marketing-Functions of Marketing-Marketing vs. Selling-Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation -Types of Marketing - Direct Marketing-Network Marketing - Digital Marketing-Channels of Distribution - Supply Chain Management (SCM)

UNIT - V

Project Management: Introduction to Project Management-steps in Project Management - Project Planning - Project Life Cycle-Network Analysis-Program Evaluation & Review Technique (PERT)-Critical Path Method (CPM) - Project Cost Analysis - Project Crashing - Project Information Systems

TEXT BOOKS:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
4. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
5. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.

CS602OE: CYBER LAWS AND ETHICS (Open Elective – I)

B.Tech. CSE/IT/ITE/CSIT III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession.

Course Outcomes

- The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.
- The students will learn the rights and responsibilities as an employee, team member and a global citizen

UNIT - I

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT - II

Secure System Planning and administration, Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT - III

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy-developing standards.

UNIT - IV

Information security: fundamentals-Employee responsibilities- information classification-Information handling- Tools of information security- Information processing-secure program administration.

UNIT - V

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

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.

CS700OE: DATA STRUCTURES (Open Elective - II)

B.Tech. CSE/IT/ITE/CSIT IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisite:

1. A course on "Programming for Problem Solving "

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

Course Outcomes:

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT - I

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

UNIT - II

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash table representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT - III

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

UNIT - IV

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sortings: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

UNIT - V

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXT BOOKS:

1. Fundamentals of data structures in C, 2 nd edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data structures using c – A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCE BOOKS:

1. Data structures: A Pseudocode Approach with C, 2nd edition, R.F.Gilberg And B.A.Forouzan, Cengage Learning.
2. Introduction to data structures in c, 1/e Ashok Kamthane.

CS701OE: ARTIFICIAL INTELLIGENCE (Open Elective - II)

B.Tech. CSE/IT/ITE/CSIT IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on “Computer Programming and Data Structures”.
2. A course on “Advanced Data Structures”.
3. A course on “Design and Analysis of Algorithms”.
4. A course on “Mathematical Foundations of Computer Science”.
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful.

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching wih Partial Observations, Online Search Agents and Unknown Environment .

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT - IV

Planning

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT - V

Uncertain knowledge and Learning

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E.Rich and K.Knight (TMH).
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

CS702OE: PYTHON PROGRAMMING (Open Elective - II)

B.Tech. CSE/IT/ITE/CSIT IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives: This course will enable students to

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python.
- Build Web Services and introduction to Network and Database Programming in Python.

Course Outcomes: The students should be able to:

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Demonstrate proficiency in handling Strings and File Systems.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types

Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Mapping and Set Types

UNIT - II

FILES: File Objects, File Built-in Function [open()], File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, *Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, *Creating Exceptions, Why Exceptions (Now)?, Why Exceptions at All?, Exceptions and the sys Module, Related Modules

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules

UNIT - III

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT - IV

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs

WEB Programming: Introduction, Wed Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application

Advanced CGI, Web (HTTP) Servers

UNIT – V

Database Programming:

Introduction, Python Database Application Programmer's Interface (DB-API), Object Relational Managers (ORMs), Related Modules

TEXT BOOK:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

CS703OE: JAVA PROGRAMMING (Open Elective - II)

B.Tech. CSE/IT/ITE/CSIT IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on “Computer Programming & Data Structures”

Course Objectives:

- Introduces object-oriented programming concepts using the Java language.
- Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
- Introduces the implementation of packages and interfaces
- Introduces exception handling, event handling and multithreading
- Introduces the design of Graphical User Interface using applets and AWT

Course Outcomes:

- Develop Programs with reusability
- Develop programs to handle multitasking
- Develop programs to handle exceptions
- Develop applications for a range of problems using object-oriented programming techniques
- Design simple Graphical User Interface applications

UNIT - I

Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT - II

Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.
Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.
Exploring java.io.

UNIT - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util.

UNIT - IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.
The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box group, choices, lists, dialog box, handling menus, layout manager: layout manager types – border, grid, flow, card and grid bag.

UNIT V

Multi-Threading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

TEXT BOOKS:

1. Java the complete reference, 7th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.

CS800OE: MACHINE LEARNING (Open Elective – III)

B.Tech. CSE/IT/ITE/CSIT IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. Course on "Data Structures".
2. Knowledge on statistical methods.

Course Objectives:

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes:

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias**.**

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.
Reinforcement Learning – Introduction, the learning task, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V
Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.
Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.
Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

TEXT BOOK:
1. Machine Learning – Tom M. Mitchell, - MGH

REFERENCE BOOK:
1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis

CS801OE: MOBILE APPLICATION DEVELOPMENT (Open Elective - III)

B.Tech. CSE/IT/ITE/CSIT IV Year II Sem

L	T	P	C
3	0	0	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 improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on 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:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- 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 Activity, 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)

TEXT BOOKS:

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

CS802OE: SCRIPTING LANGUAGES (Open Elective - III)

B.Tech. CSE/IT/ITE/CSIT IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on “Computer Programming and Data Structures”
2. A course on “Object Oriented Programming Concepts”

Course Objectives:

- This course introduces the script programming paradigm
- Introduces scripting languages such as Perl, Ruby and TCL.
- Learning TCL

Course Outcomes:

- Comprehend the differences between typical scripting languages and typical system and application programming languages.
- Gain knowledge of the strengths and weakness of Perl, TCL and Ruby; and select an appropriate language for solving a given problem.
- Acquire programming skills in scripting language

UNIT - I

Introduction: Ruby, Rails, The structure and Excution of Ruby Programs, Package Management with RUBYGEMS, Ruby and web: Writing CGI scripts, cookies, Choice of Webservers, SOAP and webservices.

RubyTk – Simple Tk Application, widgets, Binding events, Canvas, scrolling

UNIT - II

Extending Ruby: Ruby Objects in C, the Jukebox extension, Memory allocation, Ruby Type System, Embedding Ruby to Other Languages, Embedding a Ruby Interperter

UNIT - III

Introduction to PERL and Scripting

Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT - IV

Advanced PERL

Finer points of looping, pack and unpack, filesystem, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT - V

TCL: TCL Structure, syntax, Variables and Data in TCL, Control Flow, Data Structures, input/output, procedures, strings, patterns, files, Advance TCL- eval, source, exec and uplevel commands, Name spaces, trapping errors, event driven programs, making applications internet aware, Nuts and Bolts Internet Programming, Security Issues, C Interface.

Tk: Tk-Visual Tool Kits, Fundamental Concepts of Tk, Tk by example, Events and Binding, Perl-Tk.

TEXT BOOKS:

1. The World of Scripting Languages, David Barron, Wiley Publications.

2. Ruby Programming language by David Flanagan and Yukihiro Matsumoto O'Reilly
3. "Programming Ruby" The Pramatic Programmers guide by Dabve Thomas Second edition

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux Apache, MySQL, Perl and PHP, J.Lee and B. Ware (Addison Wesley) Pearson Education.
2. Perl by Example, E. Quigley, Pearson Education.
3. Programming Perl, Larry Wall, T. Christiansen and J. Orwant, O'Reilly, SPD.
4. Tcl and the Tk Tool kit, Ousterhout, Pearson Education.
5. Perl Power, J.P. Flynt, Cengage Learning.

CS803OE: DATABASE MANAGEMENT SYSTEMS (Open Elective - III)

B.Tech. CSE/IT/ITE/CSIT IV Year II Sem

L	T	P	C
3	0	0	3

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 data base 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 data bases.

Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT - IV

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, Validation- Based Protocols, Multiple Granularity, 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 base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:

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

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.

AI600OE: FUNDAMENTALS OF AI

B.Tech. CSE (AIML) III Year II Sem

L	T	P	C
3	0	0	3

Course Objective:

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

Course Outcomes:

- Possess the ability to formulate an efficient problem space for a problem expressed in English.
- Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique.
- Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems and Machine Learning.

UNIT – I

Foundations of AI: What is AI, History of AI, Strong and weak AI, The State of the Art. Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT – II

Solving Problems by Searching: Problem – Solving Agents, Example Problems, Searching for Solutions, uniformed search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.

UNIT – III

Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information, The Internet Shopping World.

UNIT – IV

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Learner Models, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

UNIT – V

Learning Probabilistic Models: Statistical Learning, Learning with Complete data. Learning with Hidden variables: The EM Algorithm.

TEXT BOOKS:

1. “Artificial Intelligence A Modern Approach”, Stuart J. Russell & Peter Norvig – Pearson.
2. “Artificial Intelligence”, Elaine Rich, Kevin Knight & Shivashankar B Nair – McGraw Hill Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education

AI601OE: MACHINE LEARNING BASICS

B.Tech. CSE (AIML) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To understand pattern classification algorithms to classify multivariate data
- To understand the Implementation of genetic algorithms
- To gain knowledge about Q-Learning
- To create new machine learning techniques.

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

- Develop and apply pattern classification algorithms to classify multivariate data.
- Develop and apply regression algorithms for finding relationships between data variables.
- Develop and apply reinforcement learning algorithms for learning to control complex systems.
- Write scientific reports on computational machine learning methods, results and conclusions.

UNIT - I:

BASICS Learning Problems Perspectives and Issues Concept Learning Version Spaces and Candidate eEliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT - II:

Neural Networks and Genetic Algorithms: Neural Network Representation Problems Perceptions Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms Hypothesis Space Search– Genetic Programming – Models of Evolutions and Learning.

UNIT - III:

Bayesian and Computational Learning: Bayes Theorem Concept Learning Maximum Likelihood Minimum Description Length Principle Bayes Optimal Classifier Gibbs Algorithm Naïve Bayes Classifier Bayesian Belief Network EM Algorithm Probability Learning Sample Complexity Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT - IV

Instant Based Learning: K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.

UNIT - V

Advanced Learning: Learning Sets of Rules Sequential Covering Algorithm Learning Rule Set First Order Rules Sets of First Order Rules Induction on Inverted Deduction Inverting Resolution Analytical Learning Perfect Domain Theories Explanation Base Learning – FOCL Algorithm - Reinforcement Learning Task Learning Temporal Difference Learning

TEXT BOOKS:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 2010.
2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995.

REFERENCE BOOK:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

AI700OE: AI Applications

B.Tech. CSE (AIML) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives: To give deep knowledge of AI and how AI can be applied in various fields to make life easy.

Course Outcomes: After completion of course, students would:

- To correlate AI and solutions to modern problems.
- To decide when to use which type of AI technique.
- Understand Robotic Processes Automation
- Analyze AI-Optimized Hardware

UNIT - I

Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications of Artificial Intelligence (AI) in business.

UNIT - II

Emotion Recognition using human face and body language, AI based system to predict diseases early, Smart Investment analysis, AI in Sales and Customer Support.

UNIT - III

Robotic Processes Automation for supply chain management.

UNIT - IV

AI-Optimized Hardware, Digital Twin i.e. AI Modeling, Information Technology & Security using AI.

UNIT - V

Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chain and AI.

Text Books:

1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley & Sons.
2. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

Reference Books:

1. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, 2018.
2. Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, 2017.

AI701OE: INTRODUCTION TO NATURAL LANGUAGE PROCESSING

B.Tech. CSE (AIML) IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisites:
Data structures, finite automata and probability theory

Course Objectives:

- Introduction to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes:

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT - I
Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models
Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II
Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms

UNIT - III
Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems

UNIT - IV
Predicate-Argument Structure, Meaning Representation Systems

UNIT - V
Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, bayesian parameter estimation, Language Model Adaptation, Language Models- class based, variable length, bayesian topic based, Multilingual and Cross Lingual Language Modeling

TEXT BOOKS:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication.

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky & James H Martin, Pearson Publications.
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

AI800OE: CHATBOTS

B.Tech. CSE (AIML) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on concepts of chatbots and understanding the developer environment botframework.

Course Outcomes:

- Understand basic concepts of chatbots
- Analyze different entities in building bots
- Understand the concepts of advanced bot building
- Discuss different types of chatbot use cases

UNIT- I:

Introduction to Chatbots: Definition of chatbots, Journey of Chatbots, Rise of Chatbots, Messaging Platforms.

UNIT- II:

Setting Up the Developer Environment Botframework: Local Installation, Installing NodeJS, Following the Development Pipeline, Storing Messages in Database.

UNIT - III:

Basics of Bot Building- Intents, Entities.

UNIT - IV:

Advanced Bot Building: Design Principles, Showing Product Results, Saving Messages, Building Your Own Intent Classifier.

UNIT - V:

Business and Monetization: Analytics, Chatbot Use Cases- Modes of Communication- Business-to-Business (B2B), Chap Business-to-Consumer (B2C) Consumer-to-Consumer (C2C) Business-to-Employee (B2E), Employee-to-Employee (E2E), Chatbots by Industry Vertical.

Text Book:

1. Rashid Khan, Anik Das, Build Better Chatbots: A Complete Guide to Getting Started with Chatbots, Apress.

AI801OE: GENETIC ALGORITHMS & FUZZY LOGIC

B.Tech. CSE (AIML) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on concepts of fundamentals of genetic algorithms, genetic technology and fuzzy logic

Course Outcomes:

- Understand the Fundamentals of genetic algorithm
- Discuss Knowledge based techniques in Genetic Algorithm and techniques in genetic search
- Understand genetics based machine learning
- Analyze and Understand Classical Relations and Fuzzy Relations

UNIT – I:

Fundamentals of genetic algorithm: A brief history of evolutionary computation, biological terminology, search space encoding, reproduction elements of genetic algorithm genetic modeling, comparison of GA and traditional search methods. The Fundamental Theorem, Schema Processing at work, Two-armed and k-armed Bandit problem, The Building block hypothesis.

UNIT – II:

Genetic technology: steady state algorithm, fitness scaling, inversion. Genetic Programming:- Genetic Algorithm in problem solving, Implementing a Genetic Algorithm:- computer implementation, operator (reproduction, crossover and Mutation, Fitness Scaling, Coding, Discretization). Knowledge based techniques in Genetic Algorithm. Advanced operators and techniques in genetic search: Dominance, Diploidy and Abeyance. Inversion and other reordering operators, Niche and speciation.

UNIT – III:

Introduction to genetics - based machine learning: Classifier system, Rule and Message system, Apportionment of credit, Knowledge based Techniques, Genetic Algorithms and parallel. processors.

UNIT – IV:

Introduction: Background, Uncertainty and imprecision, Statistics and random processes, Uncertainty in information, Fuzzy sets and membership, Chance versus ambiguity, Classical sets - operations on classical sets to functions, Fuzzy sets-fuzzy set operations, Properties of fuzzy sets, sets as points in hypercube.

UNIT – V:

Classical Relations And Fuzzy Relations: Cartesian product, Crisp relations-cardinality of crisp relations, Operations on crisp relations, Properties of crisp relations, Compositions, Fuzzy relations cardinality of fuzzy relations, Operations on fuzzy relations, Properties of fuzzy relations, Fuzzy Cartesian product and composition, Non interactive fuzzy sets, Tolerance and equivalence relations-crisp equivalence relation, Crisp tolerance relation, Fuzzy tolerance, Max-min Method, other similarity methods

Text Books:

1. David E.Goldberg, "Genetic Algorithms in search , Optimization & Machine Learning"
2. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

References:

1. William B. Langdon, Riccardo Poli, "Foundations of Genetic Programming"
2. P. J. Fleming, A. M. S. Zalzala "Genetic Algorithms in Engineering Systems “

3. David A. Coley, "An Introduction to Genetic Algorithms for Scientists and Engineers "
4. Melanie Mitchell- 'An introduction to Genetic Algorithm'- Prentice-Hall of India
5. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Rai – PHI Publication.
6. Fuzzy Sets, Fuzzy Logic, and Fuzzy Systems by Lotfi A. Zadeh Fuzzy logic with engineering application by Timothy J. Ross-Wiley

NW600OE: GAME THEORY

B.Tech. CSE (NETWORKS) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: The course will explain in depth the standard equilibrium concepts (such as Nash equilibrium, Subgame-Perfect Nash Equilibrium, and others) in Game Theory.

Course Outcomes

- Understand the basic concepts of game theory and solutions
- Understand different types of equilibrium interpretations
- Understand and analyze knowledge and solution concepts
- Analyze extensive games with perfect information

UNIT - I

Introduction- Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation. Nash Equilibrium-Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information.

UNIT - II

Mixed, Correlated, and Evolutionary Equilibrium - Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium, Rationalizability and Iterated Elimination of Dominated Actions - Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions.

UNIT - III

Knowledge and Equilibrium - A Model of Knowledge Common Knowledge, Can People Agree to Disagree?, Knowledge and Solution Concepts, The Electronic Mail Game.

UNIT - IV

Extensive Games with Perfect Information - Extensive Games with Perfect Information
Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy, Two Notable Finite Horizon Games, Iterated Elimination of Weakly Dominated Strategies Bargaining Games - Bargaining and Game Theory, A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions.

UNIT - V

Repeated Games - The Basic Idea Infinitely Repeated Games vs. Finitely Repeated Games Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game.

Textbooks:

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press
2. Game Theory, Roger Myerson, Harvard University Press
3. Game Theory, D. Fudenberg and J. Tirole, MIT Press

References:

1. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley and Sons.
2. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
3. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

NW601OE: NETWORK ADMINISTRATION

B.Tech. CSE (NETWORKS) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on network components, network file systems, network security, and network printing

Course Outcomes:

- Install or upgrade a network operating system and understand network basics
- Analyze and implement a security policy through various nodes
- Understand monitoring system resources and configuring network services
- Understand and troubleshoot the networks.

UNIT - I

Setting up Your Environment: Getting started, Distributions to consider, Physical machines versus virtual machines, Setting up and configuring VirtualBox, Acquiring VirtualBox, Downloading and installing the Extension Pack, Acquiring and installing Debian 8, Acquiring and installing CentOS 7, Revisiting Linux Network Basics: Understanding the TCP/IP protocol suite, Naming the network device, Understanding Linux hostname resolution, Understanding the net-tools and iproute2 suites, Manually managing network interfaces, Managing connections with Network Manager

UNIT - II

Communicating Between Nodes via SSH: Using OpenSSH, Installing and configuring OpenSSH , connecting to network hosts via openssh-client, The OpenSSH config file, Understanding and utilizing scp Transferring files to another node via scp, Tunneling traffic via SSH, Generating public keys, Keeping SSH connections alive, Exploring an alternative to SSH – utilizing Mosh (mobile shell), Setting up a File Server: File server considerations, NFS v3 versus NFS v4 , Setting up an NFS server, Learning the basics of Samba Setting up a Samba server, Mounting network shares, Automatically mounting network shares via fstab and systemd, Creating networked filesystems with SSHFS

UNIT - III

Monitoring System Resources: Inspecting and managing processes, Understanding load average, Checking available memory, Using shell-based resource monitors, Scanning used storage, Introduction to logging, Maintaining log size with logrotate , Understanding the systemd init system, Understanding the systemd journal, Configuring Network Services: Planning your IP address layout, Installing and configuring a DHCP server, Installing and configuring a DNS server, Setting up an internal NTP server

UNIT - IV

Hosting HTTP Content via Apache: Installing Apache, Configuring Apache, Adding modules, Setting up virtual hosts, Understanding Advanced Networking Concepts: Dividing your network into subnets, Understanding the CIDR notation, Implementing Quality of Service, Routing TCP/IP traffic, Creating redundant DHCP and DNS servers

UNIT - V

Securing Your Network: Limiting the attack surface , Securing OpenSSH , Configuring the iptables firewall Protecting system services with fail2ban, Understanding SELinux, Configuring Apache to utilize SSL, Deploying security updates, Troubleshooting Network Issues: Tracing routing issues, Troubleshooting DHCP issues, Troubleshooting DNS issues, Displaying connection statistics with netstat, Scanning your network with Nmap and Zenmap, Installing missing firmware on Debian systems, Troubleshooting issues with Network Manager

Text Books:

1. Mastering Linux Network Administration, 2015 Packt Publishing, Packt Publishing,
2. Linux Network Administrator's Guide, 2nd Edition by Olaf Kirch & Terry Dawson 2nd Edition June 2000, Oreilly Publishers.

References:

1. The Complete Reference Linux, Richard Petersen, Mc Graw Hill.
2. Maurice J. Bach, “Design of UNIX Operating System”, PHI. 3. Linux system Administration, Tom Adelstein & Bill Lubanovic, Oreilly.
3. Unix the ultimate guide, Sumithabha Das, TMH
4. Microsoft® Windows Server® 2008 Administration, STEVE SEGUIS, Mc Graw Hill.
5. Red Hat Enterprise Linux 6 Administration, Sander van Vugt, John Wiley &sons.

NW700OE: 5G TECHNOLOGIES

B.Tech. CSE (NETWORKS) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on the concepts of 5G and 5G technology drivers. Understand 5G network architecture, components, features and their benefits.

Course Outcomes:

- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of transmission and Design Techniques for 5G
- Analyze Device-to-device (D2D) and machine-to-machine (M2M) type communications
- Learn Massive MIMO propagation channel models

UNIT – I:

Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

UNIT - II:

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.,3GPP standards for 5G

UNIT - III:

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT - IV:

Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

UNIT - V:

Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

Text Books:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose. F. Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.

Reference Books:

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press

3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S. Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

NW701OE: OPTIMIZATION TECHNIQUES

B.Tech. CSE (NETWORKS) IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisite: Mathematics –I, Mathematics –II

Course Objectives:

- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- Constrained and unconstrained optimization techniques for solving and optimizing electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

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

- explain the need of optimization of engineering systems
- understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- Formulate optimization problems.

UNIT - I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surface - classification of Optimization problems.

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT - II

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems. Degeneracy.

Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT - III

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints: Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints: Kuhn – Tucker conditions.

Single Variable Nonlinear Unconstrained Optimization: Elimination methods: Uni Model function-its importance, Fibonacci method & Golden section method.

UNIT - IV

Multi variable nonlinear unconstrained optimization: Direct search methods – Univariant method, Pattern search methods – Powell's, Hooke - Jeeves, Rosenbrock's search methods. Gradient methods: Gradient of function & its importance, Steepest descent method, Conjugate direction methods: Fletcher-Reeves method & variable metric method.

UNIT - V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Text Books:

1. Optimization Techniques & Applications by S.S.Rao, New Age International.
2. Optimization for Engineering Design by Kalyanmoy Deb, PHI

Reference Books:

1. George Bernard Dantzig, Mukund Narain Thapa, “Linear programming”, Springer series in Operations Research 3rd edition, 2003.
2. H. A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007.
3. Optimization Techniques by Belegundu & Chandrupatla, Pearson Asia.
4. Optimization Techniques Theory And Practice by M.C.Joshi, K.M.Moudgalya, Narosa Publications.

NW800OE: BLOCKCHAIN TECHNOLOGY

B.Tech. CSE (NETWORKS) IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites

1. Knowledge in security and applied cryptography.
2. Knowledge in distributed databases.

Course Objectives:

- To Introduce block chain technology and Cryptocurrency

Course Outcomes:

- Learn about research advances related to one of the most popular technological areas today.
- Understand Extensibility of Blockchain concepts
- Understand and Analyze Blockchain Science
- 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:

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

NW801OE: REAL TIME SYSTEMS

B.Tech. CSE (NETWORKS) IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisite: Computer Organization and Operating System

Course Objectives:

- To provide a broad understanding of the requirements of Real Time Operating Systems.
- To make the student understand, applications of these Real Time features using case studies.

Course Outcomes:

- Be able to explain real-time concepts such as preemptive multitasking, task priorities, priority
- inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time, and semaphores.
- Able describes how a real-time operating system kernel is implemented.
- Able explains how tasks are managed.
- Explain how the real-time operating system implements time management.
- Discuss how tasks can communicate using semaphores, mailboxes, and queues.
- Be able to implement a real-time system on an embedded processor.
- Be able to work with real time operating systems like RT Linux, VxWorks, MicroC /OSII, TinyOs

UNIT – I

Introduction: Introduction to UNIX/LINUX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

UNIT - II

Real Time Operating Systems: Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, asks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

UNIT - III

Objects, Services and I/O: Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

UNIT - IV

Exceptions, Interrupts and Timers: Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

UNIT - V

Case Studies of RTOS: RT Linux, MicroC/OS-II, VxWorks, Embedded Linux, and Tiny OS.

Text Book:

1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011

Reference Books:

1. Embedded Systems- Architecture, Programming and Design by Rajkamal, 2007, TMH.
2. Advanced UNIX Programming, Richard Stevens.
3. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh.

CB600OE: OPERATIONS RESEARCH

B.Tech. CSBS III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on concepts of optimization techniques, formulation of a LPP, Nonlinear programming concepts.

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

- Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
- Students should able to apply the concept of non-linear programming
- Students should able to carry out sensitivity analysis
- Student should able to model the real-world problem and simulate it.

UNIT - I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

UNIT - II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT - III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.

UNIT - IV

Model Curriculum of Engineering & Technology PG Courses [Volume -II] [31] Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT - V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

Text Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.

References:

1. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi, 2008.
2. Hitler Libermann Operations Research: McGraw Hill Pub. 2009.
3. Pannerselvam, Operations Research: Prentice Hall of India 2010.
4. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

CB601OE: CLOUD COMPUTING

B.Tech. CSBS III Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites:

1. A course on “Computer Networks”.
2. A course on “Operating Systems”.
3. 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:

- Ability to understand various service delivery models of a cloud computing architecture.
- Ability to understand the ways in which the cloud can be programmed and deployed.
- Understanding 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 Labs, 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.

CB700OE: DESIGN THINKING

B.Tech. CSBS IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To inculcate core design principles and applied creativity to develop innovative strategies that better connect engineers with their end users.
- To build mindset leading to flow of creative ideas, validating those ideas and prioritizing the best ones.
- To incorporate tools that designers need to take a design project from inspiration and insights to ideation and implementation.
- To instill full scope of organizational innovation and strategy through knowledge, insight and analytical skills.

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

- Use design thinking and hypothesis-driven innovation processes to develop viable solutions to user challenges.
- Use multiple brainstorming techniques to find innovative solutions.
- Develop and test a business model or business case to support the viability of the solution.
- Prototype a solution to a user challenge.
- Investigate the cultural, emotional, technological and business factors relevant to developing new product or service design concept.

UNIT - I

Revisiting Design Thinking: Creative thinking as basis of innovation; Empathy process for deep understanding of challenge with practical ingenuity; Making sense of observations and insights;
Defining a point of view and context Design thinking skills for Problem Discovery, Definition, and Ideation – Identifying problems in daily lives and in the world at large, Understanding user and customer perspectives, Thinking from the problem before thinking of a solution.

UNIT - II

Ideation Process: Clear Articulation of problem statement with focus on latent needs; Brainstorming potential solutions; Ideation methods with case-study based approach to using Systematic Inventive Thinking (SIT) Methods such as Addition, Subtraction, Multiplication, Division and Task Unification Strategic Innovation for competition in future: Linear Innovation vs. non-linear innovation, Understanding and identifying weak signals, 3-box thinking, 3-Box framework and Box-3 ideation.

UNIT - III

Designing Customer Experience: Understanding Innovation through Design Thinking; Enhancing Customer Experience; Service Design and Development Process and Case Studies; Service Experience Cycle and Case Studies.

UNIT - IV

Sustainable Design Approaches: Concern for Environment and Sustainability in Design, Case Studies to understand good Design For Environment (DFE) Decisions; Design Considerations in the five stages of the Product Life Cycle.

UNIT - V

Integrative Engineering Design Solutions: Identifying and resolving issues with working in diverse teams, Modularising, prototype building by different engineering disciplines within the team, validated learning with accessible metrics.

Capstone Project (Interdisciplinary)
Applying Design Thinking Principles and Methods for Ideation and Prototyping, Testing Solution, Refining Solution, and Taking the Solution to the Users

Text Books:

1. 101 Design Methods: A Structured Approach for Driving Innovation in Your Organization, Vijay Kumar, John Wiley & Sons, ISBN: 978-1118083468, 2012
2. Living with Complexity, Donald A Norman, MIT Press, ISBN: 978-0262528948, 2016
3. Design Thinking for Entrepreneurs and Small Businesses: Putting the Power of Design to Work, Beverly Rudkin Ingle, A Press, ISBN: 978-1430261810, 2013

References:

1. Emotionally Durable Design: Objects, Experiences and Empathy, Jonathan Chapman, 2nd Edition, Routledge, ISBN: 978-0415732161, 2015
2. Innovation Design: How Any Organization Can Leverage Design Thinking to Produce Change, Drive New Ideas, and Deliver Meaningful Solutions, Thomas Lockwood, Edgar Papke, New Page Books, ISBN: 978-1632651167, 2017
3. Design Thinking Business Analysis: Business Concept Mapping Applied, Thomas Frisendal, Springer, ISBN: 978-3642434822, 2012
4. Chapter 1: A Simple Framework for Leading Innovation, The Three Box Solution, HBR Press, 2016
5. Design a Better Business: New Tools, Skills and Mindset for Strategy and Innovation, Patrick Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Erik van der Pluijm, Maarten van Lieshout, Wiley, ISBN: 978-8126565085, 2016.

CB701OE: ENTERPRISE RESOURCE PLANNING

B.Tech. CSBS IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To provide a contemporary and forward-looking view on the theory and practice of Enterprise Resource Planning Technology.
- To focus on a strong emphasis upon practice of theory in Applications and Practical Oriented approach.
- To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth.
- To aim at preparing the students technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:

- Make basic use of Enterprise software, and its role in integrating business functions
- Analyze the strategic options for ERP identification and adoption.
- Design the ERP implementation strategies.
- Create reengineered business processes for successful ERP implementation.

UNIT - I

ERP Introduction, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP. Integrated Data Model. Scope – Technology – Benefits of ERP: Reduction in cycle Time, Lead Time & Cost, Improved Resource Utilization, Supplier Performance. Flexibility, Accuracy & Decision Making, Customer Satisfaction & On-time Shipment.

UNIT - II

Business Process Reengineering, Management Information system, Decision Support System, Executive Information System. Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.

UNIT - III

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP-Modules: Functional Modules, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications, Manufacturing and logistics modules.

UNIT - IV

ERP Implementation: Implementation Life Cycle -Implementation Methodology - Hidden Costs - Organizing Implementation - Vendors, Consultants and Users Contracts-Project Management and Monitoring- Role of SDLC/SSAD.

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

Text Books:

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning Concepts and Practice”, PHI.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning", Thompson Course Technology.

Reference Books:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill.
2. Rahul V. Altekar “Enterprise Resource Planning”, Tata McGraw Hill.
3. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – A Concepts and Practice”, PHI.
4. Mary Summer, “Enterprise Resource Planning”- Pearson Education.

CB800OE: INNOVATION IP MANAGEMENT & ENTREPRENEURSHIP

B.Tech. CSBS IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To develop entrepreneurship skills of commercial appreciation by allocating knowledge about substantive aspects of management, strategy and legal literature.
- To discuss intellectual property strategy to protect inventions and innovations of new ventures.
- The course will make the students understand the nature, scope and differences of IP, its different utilities and approaches
- The course will manage and strategize IP lifecycle effectively throughout the journey of start-up, in a time when it is aspired highly by the economy and society.
- Participants will learn the fundamentals and advanced strategies of IP. They will be given the opportunity for understanding the same in the MSME sector. They will finally be provided brief exposure about the valuation techniques and audits of IP.

Course Outcomes:

- describe the requirements and responsibilities put on management, board members and shareholders in different development situations
- define the needs for resources as well as obstacles in the early stages of the development of a business
- independently formulate a business plan based on a business idea in technology
- plan and implement a development project in a team
- describe the fundamentals of intellectual property rights and legislation, particularly in the biotech industry.

UNIT - I: Entrepreneurship

Introduction, Relation between IP and Entrepreneurship, Role of IP identifying threshold innovative entrepreneurs. Innovative entrepreneurship, Opportunity recognition and entry strategies. Competitive advantage through IP protection, IP protection for Startups.

UNIT - II: Innovation

Introduction to innovation, Creativity, Different types of innovation, Open innovation, Adaptability of an innovation, Innovation vs. Invention, Divergent and convergent thinking, Idea generation, Idea validation, Idea protection, Necessity of innovation in current business world.

UNIT - III: Intellectual Property

Introduction, Traditional knowledge vs. Intellectual Property, Different types of IP, Copyrights, Trademarks, Geographical Indications, Trade secrets, Patents; Transforming IP into Economy; IP protection in developed nations, and developing nations. Position of India in IP protection (Agriculture, Pharmaceutical and engineering sectors).

UNIT - IV: IPR and Technical Inventions

Patent, Patentability requirements, Patent drafting, Patent lifecycle; Software Patents: Design Patents; Protection of Various aspects of Embodied Inventions; Integrated circuit designs protection; Software Inventions or algorithms: Copyright vs Patent.

UNIT - V: IP strategy and Entrepreneurship

IP strategy for start-up and MSME, IP transaction, IP valuation, Government Initiatives: Incubators, research parks, Various Government policies, Integrative approach – Entrepreneurship & IP strategy, Fee relaxations for patents for Start-ups and small entities.

Text Books:

1. Ove Granstrand, The Economic and management of Intellectual Property, (1999)
2. Narayanan, V. K., Managing technology and innovation for competitive advantage, first edition, Pearson education, New Delhi, (2006)
3. Idris, K. (2003), Intellectual property: a power tool for economic growth, second edition, WIPO publication no. 888, Switzerland
4. Bosworth D. & Webster E, The Management of Intellectual Property, Edward Elgar.

References:

1. Berman, Ideas to Assets, Wiley publications
2. Richard Dorf& Thomas Byers, Technology ventures from idea to enterprise, 2nd edition.

Additional Reading:

1. WIPO - http://www.wipo.int/patents/en

CB801OE: SOCIAL MEDIA ANALYTICS

B.Tech. CSBS IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on social media and its analytics

Course Outcomes:

- Understanding characteristics and types of social media
- Knowledge on layers of social media analytics
- Apply text analysis tools on social media data
- Understand the significance of action analytics
- Detect viral topics on social media (YouTube)

UNIT - I: Introduction To social media

World Wide Web, Web 1.0, Web 2.0, Web 3.0, social media, Core Characteristics of social media, Types of social media, Social Networking Sites, Using Facebook for Business Purposes, Content Communities

UNIT - II: Social Media Analytics Overview

Purpose Of Social Media Analytics, social media Vs. Traditional Business Analytics, Seven Layers Of Social Media Analytics, Types Of Social Media Analytics, Social Media Analytics Cycle, Challenges To Social Media Analytics, Social Media Analytics Tools.
Case Study: The Underground Campaign That Scored Big

UNIT - III: Social Media Text Analytics

Types Of social media Text, Purpose of Text Analytics, Steps In Text Analytics, Social Media Text Analysis Tools.
Case Study: Tapping Into Online Customer Opinions

UNIT - IV: Social Media Actions Analytics

Introduction To Actions Analytics, Common Social Media Actions, Actions Analytics Tools.
Case Study: Cover-More Group

UNIT - V: Social Media Hyperlink Analytics

Types Of Hyperlinks, Hyperlink Analytics, Types of Hyperlink Analytics, Hyperlink Analytics Tools.
Case Study: Hyperlinks And Viral YouTube Videos

Text Books:

1. Seven Layers of Social Media Analytics Mining Business Insights from social media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, And Location Data by Gohar F. Khan Isbn: 1507823207, Isbn-13: 9781507823200

Reference Books:

1. Social Media Analytics: Techniques And Insights for Extracting Business Value Out of social media By Matthew Ganis, Avinash Kohirkar, Pearson Education.
2. Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, Marshall Sponder, MGH.
3. Big Data and Analytics, Seema Acharya, Subhasinin Chellappan, Wiley Publications.
4. Big Data, Black Book^{tm}, Dreamtech Press, 2015 Edition.

CY600OE: CYBER LAWS

B.Tech. CSE(CS) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: To understand the significance of cyber laws and different acts.

Course Outcomes:

- Understand the need of cyber laws
- Understand the important provisions of the act and 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, 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, E-Governance Attribution, Acknowledgement and Dispatch of Electronic Records, Certifying Authorities, Electronic Signature Certificates, Duties of Subscribers, Penalties and Offences, Intermediaries

UNIT - III

Overview Of Rules Issued Under the It Act, 2000, Electronic Commerce, Electronic Contracts, Cyber Crimes, Cyber Frauds

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 Cyberstalking in India.

Text Book:

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.

CY601OE: ETHICAL HACKING

B.Tech. CSE(CS) III Year II Sem

L	T	P	C
3	0	0	3

Prerequisites:

1. A course on “Operating Systems”
2. A course on “Computer Networks”
3. A course on “Network Security and Cryptography”

Course Objectives:

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing 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.

CY700OE: COMPUTER SECURITY & AUDIT ASSURANCE

B.Tech. CSE(CS) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- State the basic concepts in information systems security, including security technology and principles, software security and trusted systems, and IT security management.
- Explain concepts related to various cryptographic tools.

Course Outcomes:

- State the requirements and mechanisms for identification and authentication.
- Explain and compare the various access control policies and models as well as the assurance of these models.
- Understand various standard practices and policies in conducting audits.
- Understand and analyze the significance of Network Security and Control, Internet Banking Risks and Control

UNIT - I

System Audit and Assurance – Characteristics of Assurance services, Types of Assurances services, Certified Information system auditor, Benefits of Audits for Organization, COBIT

UNIT - II

Internal Control and Information system Audit - Internal Control, Detective control, Corrective Control, Computer Assisted Audit Tools and Techniques

UNIT - III

Conducting Audit – Standard practices, policies, Audit planning, Risk Assessment, Information gathering techniques, Vulnerabilities, System security testing, conducting Audits for Banks

UNIT - IV

Network Security and Control, Internet Banking Risks and Control, Operating System Risks and Control, Operational Control Overview

UNIT - V

Business Continuity and Disaster Recovery Planning Control – Data backup/storage, Developing appropriate Disaster recovering strategy, Business Impact analysis

Text Books:

1. Information System Audit and Assurance; D. P. Dube, Ved Prakash Gulati; Tata McGraw-Hill Education, 01-Jan 2005

References:

1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, Pearson education
2. Martin Weiss and Michael G. Solomon, Auditing IT Infrastructures For Compliance (Information Systems Security & Assurance), Jones and Bartlett Publishers, Inc.

CY701OE: SOCIAL MEDIA SECURITY

B.Tech. CSE(CS) IV Year I Sem

L	T	P	C
3	0	0	3

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

Course Outcomes:

- Learn about browser's risks
- Learn about Social Networking, Understand the risks while using social media. Guidelines for social networking
- Understand how to secure different web browsers.
- 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 Crowdsourcing 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

References:

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.

CY800OE: 5G TECHNOLOGIES

B.Tech. CSE(CS) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: Knowledge on the concepts of 5G and 5G technology drivers. Understand 5G network architecture, components, features and their benefits.

Course Outcomes:

- Understand 5G and 5G Broadband Wireless Communications
- Understand 5G wireless Propagation Channels
- Understand the significance of transmission and Design Techniques for 5G
- Analyze Device-to-device (D2D) and machine-to-machine (M2M) type communications
- Learn Massive MIMO propagation channel models

UNIT – I:

Overview of 5G Broadband Wireless Communications: Evolution of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro), An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

UNIT - II:

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.,3GPP standards for 5G

UNIT - III:

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), non-orthogonal multiple accesses (NOMA).

UNIT - IV:

Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop and multi-operator D2D communications.

UNIT - V:

Millimeter-wave Communications – spectrum regulations, deployment scenarios, beam-forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).

Text Books:

1. Martin Sauter “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose. F. Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks” , Cambridge University Press.

Reference Books:

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press

3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S. Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

CY801OE: DATA PRIVACY

B.Tech. CSE(CS) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

- The objective of this course is to create architectural, algorithmic and technological foundations for the maintenance of the privacy of individuals.
- Students are able to learn the concepts of confidentiality of organizations, and the protection of sensitive information, despite the requirement that information be released publicly or semi-publicly.

Course Outcomes:

- Discuss the concepts of privacy in today's environment.
- How automation is changing the concepts and expectations concerning privacy and the increasingly interconnected issue of security.
- Explain the knowledge of the role of private regulatory and self-help efforts.
- How emerging issues are affecting society and business, with a concentration on how information security must shape corporate practices.

UNIT - I:

Introduction- Fundamental Concepts, Definitions, Statistics, Data Privacy Attacks, Data linking and profiling, access control models, role based access control, privacy policies, their specifications, languages and implementation, privacy policy languages, privacy in different domains- medical, financial, etc.

UNIT - II:

Data explosion- Statistics and Lack of barriers in Collection and Distribution of Person- specific information, Mathematical model for characterizing and comparing real-world data sharing practices and policies and for computing privacy and risk measurements, Demographics and Uniqueness, **Protection Models**- Null-map, k-map, Wrong map

UNIT - III:

Survey of techniques- Protection models (null-map, k-map, wrong map), Disclosure control, Inferring entity identities, Strength and weaknesses of techniques, entry specific databases.

UNIT - IV:

Computation systems for protecting delimited data- MinGen, Datafly, Mu-Argus, k- Similar, Protecting textual documents: Scrub.

UNIT - V:

Technology, Policy, Privacy and Freedom- Medical privacy legislation, policies and best practices, Examination of privacy matters specific to the World Wide Web, Protections provided by the Freedom of Information Act or the requirement for search warrants.

Text Books:

1. B. Raghunathan, The Complete Book of Data Anonymization: From Planning to Implementation, 1st Edition, Auerbach Pub, 2013.
2. L. Sweeney, Computational Disclosure Control: A Primer on Data Privacy Protection, MIT Computer Science, 2002.

References:

1. Nishant Bhajaria Data Privacy: A runbook for engineers, Manning Publications
2. Gwen Kennedy, Data Privacy Law: A Practical Guide to the GDPR, ISBN-13: 978-0999512722, ISBN-10: 0999512722

DS600OE: FUNDAMENTALS OF DATA SCIENCE

B.Tech. CSE (DS)/ CE (SE) III Year II Sem

L	T	P	C
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Course Objectives:

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration
- Understand the basic types of data and basic statistics
- Identify the importance of data reduction and data visualization techniques

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

- Understand basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data
- describe the data using various statistical measures
- utilize R elements for data handling
- perform data reduction and apply visualization techniques.

UNIT - I: Introduction

Definition of Data Science- Big Data and Data Science hype – and getting past the hype - Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting.

Basics of R: Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II: Data Types & Statistical Description

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes.

Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter-quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting,

Matrices: Creating and Naming Matrices, Matrix Sub setting, Arrays, Class.

Factors and Data Frames: Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements.

Iterative Programming in R: Introduction, While Loop, For Loop, Looping Over List.

Functions in R: Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V:

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation.

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. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed. The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, "Statistical programming in R", Oxford Publications.

Reference Books:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
2. Brain S. Everitt, "A Handbook of Statistical Analysis Using R", Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, "Introductory statistics with R", Springer Science & Business Media, 2008.
4. Paul Teetor, "R Cookbook", O'Reilly, 2011.

DS601OE: R PROGRAMMING

B.Tech. CSE (DS)/ CE (SE) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

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 subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, 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 (References).
2. The Art of R Programming by Norman Matloff Cengage Learning India.

Reference Books:

1. Hadley Wickham, Garrett Grolemund, 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.

DS700OE: DATA ANALYTICS

B.Tech. CSE (DS)/ CE (SE) IV Year I Sem

L	T	P	C
3	0	0	3

Prerequisites

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

Course Objectives:

- To explore the fundamental concepts of data analytics.
- To learn the principles and methods of statistical analysis
- Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
- To understand the various search methods and visualization techniques.

Course Outcomes: After completion of this course students will be able to

- Understand the impact of data analytics for business decisions and strategy
- Carry out data analysis/statistical analysis
- To carry out standard data visualization and formal inference procedures
- Design Data Architecture
- Understand various Data Sources

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 Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT - II

Data Analytics: Introduction to Analytics, 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 - 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

Object Segmentation: Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, 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. Student’s Handbook for Associate Analytics – II, III.

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

Reference Books:

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addision Wisley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand Rajaraman Milliway Labs Jeffrey D Ullman Stanford Univ.

DS701OE: DATA MINING

B.Tech. CSE (DS)/ CE (SE) IV Year I Sem

L	T	P	C
3	0	0	3

Pre-Requisites:

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

Course Objectives:

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcomes:

- Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT - I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns – Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

UNIT - II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT - III

Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

UNIT - IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT - V

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data–Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

Text Books:

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

Reference Book:

1. Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

DS800OE: DATA VISUALIZATION USING PYTHON

B.Tech. CSE (DS)/ CE (SE) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To learn data wrangling techniques
- To introduce visual perception and core skills for visual analysis

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

- Perform data wrangling
- Explain principles of visual perception
- Apply core skills for visual analysis
- Apply visualization techniques for various data analysis tasks
- Evaluate visualization techniques

UNIT - I:

Data Wrangling: Need of data cleanup, data clean up basics – formatting, outliers, duplicates, Normalizing and standardizing data.

UNIT - II:

Introduction of visual perception, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

UNIT - III:

Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents.

UNIT - IV:

Visualization of groups, trees, graphs, clusters, networks, software, Metaphorical visualization.

UNIT - V:

Visualization of volumetric data, vector fields, processes and simulations, Visualization of maps, geographic information, GIS systems, collaborative visualizations, evaluating visualizations.

Text Books:

1. Jacqueline Kazil and Katharine Jarmul, Data Wrangling with Python: Tips and Tools to Make Your Life Easier, O'Reilly.
2. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick A K Peters, Ltd.

Reference:

1. E. Tufte, The Visual Display of Quantitative Information, Graphics Press.

DS801OE: INTRODUCTION TO SOCIAL MEDIA MINING

B.Tech. CSE (DS)/ CE (SE) IV Year II Sem

L	T	P	C
3	0	0	3

Prerequisites: Data Analytics

Course Objectives:

- The purpose of this course is to provide the students with knowledge of social media mining principles and techniques.
- This course is also designed to give an exposure of the frontiers of social media mining (Facebook, twitter)
- To introduce new technology for data analytics and introduce community Analysis
- To introduce various Recommendation algorithms

Course Outcomes:

- Ability to understand social media and its data.
- Ability to apply mining technologies on twitter, Facebook, LinkedIn and Google.
- Ability to learn about community
- Ability to apply various Recommendation Algorithms
- Ability to analyze the Behavior of people

UNIT – I:

Introduction: What is Social Media Mining, New Challenges for Mining

Graph Essentials: Graph Basics, Graph Representation, Types of Graphs, Connectivity in Graphs, Special Graphs, Graph Algorithms.

UNIT - II

Network Measures: Centrality, Transitivity and Reciprocity, Balance and Status, Similarity.

Network Models: Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model.

UNIT - III

Data Mining Essentials: Data, Data Preprocessing, Data Mining Algorithms, Supervised Learning, Unsupervised Learning.

Community Analysis: Community Detection, Community Evaluation, Community Evaluation.

UNIT - IV

Information Diffusion in social media: Herd Behavior, Information Cascades, Diffusion of innovations, Epidemics.

Influence and Homophily: Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily.

UNIT - V

Recommendation in social media: Challenges, Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations.

Behavior Analytics: Individual Behavior, Collective Behavior.

Text Books:

1. Social Media Mining (An Introduction), Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, Cambridge University Press, Draft Version: April 20, 2014

References:

1. Mining the Social Web, 2nd Edition Data Mining Face book, Twitter, LinkedIn, Google+, GitHub, and More by Matthew A. Russell Publisher: O'Reilly Media.
2. Social Media Mining with R [Kindle Edition] Nathan Danneman Richard Heimann.

IO600OE: INTRODUCTION TO IOT

B.Tech. CSE (IOT) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to:

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

- 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.

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 Arduino.

UNIT – III

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

UNIT - IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, 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.

Reference Books:

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

IO601OE: IOT SENSORS

B.Tech. CSE (IOT) III Year II Sem

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to:

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

- 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.

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

Basics of Sensors: Introduction- Sensor Vs Transducer, Nature of Sensors, Sensor Output Characteristics, Sensing Technologies, Digital Output Sensors.

UNIT - III

Application Specific Sensors: Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors- optical presence sensor, Light Detectors: Photo diodes – phototransistor – photoresistor- CCD and CMOS image sensors, Temperature Sensors: thermos-resistive sensors – thermoelectric contact sensor.

UNIT - IV

Sensor with Microcontroller: Introduction, Amplification and Signal Conditioning, Integrated Signal Conditioning, Digital Conversion, MCU Control, MCUs for Sensor Interface, Techniques and Systems Considerations, Sensor Integration

UNIT - V

Wireless Sensing: Wireless Data and Communications, Wireless Sensing Networks, Industrial Wireless Sensing Networks, RF Sensing, Telemetry, RF MEMS, Complete System Consideration.

Text Books:

1. Frank, Randy, “Understanding smart sensors”, Artech House integrated microsystems series, 3rd Edition, 2013.
2. Jacob Fraden, “Handbook of Modern Sensors: Physics, Designs, and Applications”, 5th Edition, Springer, 2016
3. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

Reference Books:

1. Vlasios Tsiatsis, Stamatis Karnouskos, Jan Holler, David Boyle, Catherine Mulligan, "Internet of Things: Technologies and Applications for a New Age of Intelligence", Academic Press, 16-Nov- 2018.
2. Henry Leung, Subhas Chandra Mukhopadhyay, "Intelligent Environmental Sensing", Springer, 22-Jan-2015.

IO700OE: IOT AUTOMATION

B.Tech. CSE (IOT) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- While the promise of the Industrial Internet of Things (IIoT) brings many new business prospects, it also presents significant challenges ranging from technology architectural choices to security concerns.
- Students acquire the upcoming Industrial IoT: Roadmap to the Connected World Course offers important insights on overcoming the challenges and thrive in this exciting space.

Course Outcomes:

- Discover key IIoT concepts including identification, sensors, localization, wireless protocols, data storage and security
- Explore IoT technologies, architectures, standards, and regulation
- Realize the value created by collecting, communicating, coordinating, and leveraging the data from connected devices
- Examine technological developments that will likely shape the industrial landscape in the future
- Understand how to develop and implement own IoT technologies, solutions, and applications
- At the end of the program, students will be able to understand how to develop and implement their own IoT technologies, solutions, and applications.

UNIT - I:

Introduction & Architecture: What is IIoT and the connected world? the difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.
Fundamentals of Control System, introductions, components, closed loop & open loop system.

UNIT - II:

IIOT Components: Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches.

UNIT - III:

Communication Technologies of IioT: Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication.

UNIT - IV:

Visualization and Data Types of IioT: Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud database, Cloud computing, Fog or Edge computing.
Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

UNIT - V:

Retrieving Data: Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).
Control & Supervisory Level of Automation: Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP & MES.

Text Books:

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication).
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor).

Reference:

1. Jerker Delsing, IoT Automation: Arrowhead Framework, CRC Press.

IO701OE: AI APPLICATIONS

B.Tech. CSE (IOT) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives:

- To give deep knowledge of AI and how AI can be applied in various fields to make life easy.

Course Outcomes: After completion of course, students would:

- To correlate AI and solutions to modern problems.
- To decide when to use which type of AI technique.
- Understand Robotic Processes Automation
- Analyze AI-Optimized Hardware

UNIT - I

Linguistic aspects of natural language processing, A.I. And Quantum Computing, Applications of Artificial Intelligence (AI) in business.

UNIT - II

Emotion Recognition using human face and body language, AI based system to predict diseases early, Smart Investment analysis, AI in Sales and Customer Support.

UNIT - III

Robotic Processes Automation for supply chain management.

UNIT - IV

AI-Optimized Hardware, Digital Twin i.e. AI Modeling, Information Technology & Security using AI.

UNIT - V

Recent Topics in AI/ML: AI/ML in Smart solutions, AI/ML in Social Problems handling, Block chain and AI.

Text Books:

1. Sameer Dhanrajani, AI and Analytics, Accelerating Business Decisions, John Wiley & Sons.
2. Artificial Intelligence in Practice: How 50 Successful Companies Used AI and Machine Learning to Solve Problems, Bernard Marr, Matt Ward, Wiley.

Reference Books:

1. Life 3.0: Being Human in the Age of Artificial Intelligence by Max Tegmark, 2018.
2. Homo Deus: A Brief History of Tomorrow by Yuval Noah Harari, 2017.

IO800OE: IOT SECURITY

B.Tech. CSE (IOT) IV Year II Sem

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the fundamentals, various attacks and importance of Security aspects in IoT
- Understand the techniques, protocols and some idea on security towards Gaming models
- Understand the operations of Bitcoin blockchain, crypto-currency as application of blockchain technology
- Understand the essential components of IoT
- Understand security and privacy challenges of IoT

Course Outcomes:

- Incorporate the best practices learnt to identify the attacks and mitigate the same
- Adopt the right security techniques and protocols during the design of IoT products
- Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- Describe the essential components of IoT
- Find appropriate security/privacy solutions for IoT

UNIT - I

Fundamentals of IoT and Security and its need, Prevent Unauthorized Access to Sensor Data
Block ciphers Introduction to Blockchain, Introduction of IoT devices.
IoT Security Requirements, M2M Security, Message integrity Modeling faults and adversaries Difference among IoT devices, computers, and embedded devices.

UNIT - II

IoT and cyber-physical systems RFID Security, Authenticated encryption Byzantine Generals problem sensors and actuators in IoT.
IoT security (vulnerabilities, attacks, and countermeasures), Cyber Physical Object Security, Hash functions Consensus algorithms and their scalability problems Accelerometer, photoresistor, buttons.

UNIT - III

Security engineering for IoT development Hardware Security, Merkle trees and Elliptic curves digital signatures, verifiable random functions, Zero-knowledge systems motor, LED, vibrator
IoT security lifecycle Front-end System Privacy Protection, Management, Secure IoT Databases
Public-key crypto (PKI), blockchain, the challenges, and solutions, analog signal vs. digital signal,

UNIT - IV

Data Privacy Networking Function Security Trees signature algorithms proof of work, Proof of stake, Networking in IoT Device/User Authentication in IoT IoT Networking Protocols, Crypto-currencies, alternatives to Bitcoin consensus, Bitcoin scripting language and their use Real-time communication,

UNIT - V

Introduction to Authentication Techniques Secure IoT Lower Layers, Bitcoin P2P network, Ethereum and Smart Contracts, Bandwidth efficiency
Data Trustworthiness in IoT Secure IoT Higher Layers, Distributed consensus, Smart Contract Languages and verification challenges data analytics in IoT - simple data analyzing methods.

Text Books:

1. B. Russell and D. Van Duren, “Practical Internet of Things Security,” Packt Publishing, 2016.
2. FeiHU, “Security and Privacy Internet of Things (IoTs): Models, Algorithms and Implementations”, CRC Press, 2016

3. Narayanan et al., “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,” Princeton University Press, 2016.

References:

1. A. Antonopoulos, “Mastering Bitcoin: Unlocking Digital Crypto currencies,” O’Reilly, 2014.
2. T. Alpcan and T. Basar, “Network Security: A Decision and Game-theoretic Approach,” Cambridge University Press, 2011.
3. Security and the IoT ecosystem, KPMG International, 2015.
4. Internet of Things: IoT Governance, Privacy and Security Issues” European Research Cluster.
5. Ollie Whitehouse, “Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond”, NCC Group, 2014.
6. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guide to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

IO801OE: INDUSTRIAL IOT

B.Tech. CSE (IOT) IV Year I Sem

L	T	P	C
3	0	0	3

Course Objectives: To provide students with a good depth of knowledge of Designing Industrial IOT Systems for various applications.

Course Outcomes:

- Upon completion of this course, the students will be able to
- Identify the Key opportunities and benefits in Industrial IoT
- Apply virtual network to demonstrate the use of Cloud in Industrial IoT
- Analyze industrial IoT Three tier topology and data management system
- Summarize Legacy Industrial and Modern Communication Protocols
- Describe Middleware Architecture, LoRaWAN- and Augmented reality

UNIT - I:

Introduction to Industrial Internet and Use-Cases: Industrial Internet - Key IIoT Technologies-Innovation and the IIoT -Key Opportunities and Benefits -The Digital and Human Workforce - Logistics and the Industrial Internet- IOT Innovations in Retail.

UNIT - II:

The Technical and Business Innovators of the Industrial Internet: Cyber Physical Systems (CPS) – IP Mobility – Network Virtualization - SDN (Software Defined Networks)- The Cloud and Fog – Role of Big Data in IIOT - Role of Machine learning and AI in IIOT.

UNIT - III:

IIOT Reference Architecture: Industrial Internet Architecture Framework (IIAF) -Industrial Internet Viewpoints -. Architectural Topology: The Three-Tier Topology- Key System Characteristics- Data Management- Advanced data analytics.

UNIT - IV:

Protocols for Industrial Internet Systems: Legacy Industrial Protocols - Modern Communication Protocols-Proximity Network Communication Protocols- Wireless Communication Technologies-Gateways: industrial gateways - CoAP (Constrained Application Protocol) - NFC.

UNIT - V:

Middleware Software Patterns and IIOT Platforms: Publish/Subscribe Pattern: MQTT, XMPP, AMQP, DDS- Middleware Architecture- SigFox- LoRaWAN Augmented reality- Real-World Smart Factories, Application of IIOT.

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance.

Text Books:

1. Gilchrist, Alasdair, “Industry 4.0 The Industrial Internet of Things”, Apress, 2017.
2. Zaigham Mahmood, “The Internet of Things in the Industrial Sector: Security and Device connectivity, smart environments and Industry 4.0 (Springer), 2019.

References:

1. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat “Industrial Internet of Things: Cyber manufacturing Systems” (Springer), 2017.
2. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)
3. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014

4. Michahelles, “Architecting the Internet of Things”, ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer
5. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
6. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1.

E-Books:

1. https://www.apress.com/gp/book/9781484220467.

EI600OE: BASICS OF SENSORS TECHNOLOGY (Open Elective – I)

B.Tech. EIE III Year II Semester

L	T	P	C
3	0	0	3

Pre-requisites: Physics, Mathematics

Course Objectives:

1. To **provide** basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
2. To **provide** better familiarity with the Theoretical and Practical concepts of Transducers.
3. To **provide** familiarity with different sensors and their application in real life.
4. To **provide** the knowledge of various measurement methods of physical and electrical parameters

Course Outcomes:

1. After completion of the course the student is able to:
2. **Identify** suitable sensors and transducers for real time applications.
3. **Translate** theoretical concepts into working models.
4. **Design** the experimental applications to engineering modules and practices.
5. **Design** engineering solution to the Industry/Society needs and develop products.

UNIT - I

Introduction to measurement systems

General concepts and terminology, measurement systems, sensor classifications: Analog Input and Output, Digital Input and Output, general input-output configuration, methods of correction.

Passive Sensors

Resistive Sensors: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers.

Capacitive Sensors: Variable capacitor and Differential capacitor.

Inductive Sensors: Reluctance variation sensors, Eddy current sensors, Linear variable differential transformers (LVDTs), Magneto elastic sensors, Electromagnetic sensors - Sensors based on Faraday's law of Electromagnetic induction, Touch Sensors: Capacitive, Resistive, Proximity Sensors.

UNIT - II

Self-generating Sensors or active sensors

Thermoelectric Sensors: Thermocouples, Thermo electric effects, Common thermocouples, Practical thermocouple laws, Cold junction compensation in thermocouples circuits.

Piezoelectric Sensors: Piezoelectric effect, piezoelectric materials, applications.

UNIT - III

VELOCITY AND ACCELERATION MEASUREMENT

Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers-different types, Gyroscopes-applications.

Density measurements – Strain Gauge load cell method – Buoyancy method - Air pressure balance method – Gamma ray method – Vibrating probe method.

UNIT - IV

DENSITY, VISCOSITY AND OTHER MEASUREMENTS

Units of Viscosity, specific gravity scales used in Petroleum Industries, Different Methods of measuring consistency and Viscosity –Two float viscorator –Industrial consistency meter. Sound-Level Meters, Microphones, Humidity Measurement

UNIT - V

CALIBRATION AND INTERFACING

Calibration using Master Sensors, Interfacing of Force, Pressure, Velocity, Acceleration, Flow, Density and Viscosity Sensors, Variable Frequency Drive

TEXT BOOKS:

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

REFERENCES:

1. Sensors and Transducers: D. Patranabis, TMH 2003
2. Wiley & Sons Ltd. (2006).
3. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
4. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P. Neubrat, Oxford University Press.
5. Measurement system: Applications and Design – by E. O. Doeblin, McGraw Hill Publications.
6. Electronic Instrumentation by H. S. Kalsi.

EI700OE: FUNDAMENTALS OF BIOMEDICAL APPLICATIONS (Open Elective – II)

B.Tech. EIE IV Year I Semester

L	T	P	C
3	0	0	3

Course Objectives:

- Deals with the block diagram of bio medical instrumentation system and their characteristics.
- To study the ECG, EEG, EMG, and Basic biochemical electrode.
- Deals with measuring blood pressure and use of pacemaker and defibrillator and ventilator.

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

- Understand the significance of instrumentation in human physiology.
- Acquire confidence in delivering effective therapeutic and diagnostic tools for doctors.
- Develop concepts in cardiac and neuromuscular instrumentation.

UNIT – I

Basic of Biomedical Instrumentation: Components of Medical Instrumentation System, Static and dynamic characteristics of medical instruments, Problems encountered with measurements from human beings. Organization of Cell: Derivation of Nernst equation for membrane Resting potential, Generation of action potential and refractory periods, propagation methods of action potentials.

UNIT – II

ECG Measurements and Interpretation: Medical Recorders: Classification of recorders, general features of ink-jet, and PMMC writing systems. Basics of Bio chemical electrodes. Electrocardiography: Electrical conduction system of the heart, electrodes and their placement, Standard 12 – lead configurations, Interpretation of ECG waveform with respect of electro mechanical activity of the heart.

UNIT –III

Blood Pressure Measurements: Blood pressure measurement: Introduction to blood pressure, and measurements methods, Blood flow measurement methods, Phonocardiography.

UNIT – IV

Therapeutic Equipment: Basics of Pacemakers, Defibrillator, electrotherapy and its applications, Dialysis and its significance-.

UNIT – V

EEG, EMG and Respiratory Measurements: EEG block diagram, electrodes and their placement, EMG block diagram, electrode and their placement, study of neuromuscular junction, nerve conduction velocity using EMG. Respiratory Instrumentation: Mechanism of respiration, Spirometrey, Pnemuotachograph and its types, ventilators and its mode of operation.

TEXT BOOKS:

1. Medical Instrumentation – Application and Design, John G. Webster, John Wiley and sons Inc., 3rd Ed., 2003
2. Hand Book of Biomedical Instrumentation, Khandpur R.S. Tata McGraw Hill, 1994

REFERENCE BOOKS:

1. Joseph J. Carr ad John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.
2. Bronzino Joseph D, Hand Book of Biomedical Engineering, CRC Press, 1995.

EI800OE: BASICS OF VIRTUAL INSTRUMENTATION (Open Elective – III)

B.Tech. EIE IV Year II Semester

L	T	P	C
3	0	0	3

Course Objectives: Student will be able to

- Develop virtual instruments for specific application using LabVIEW software.
- Ease the programming required to make computer interact with real world.
- To acquire, analyze and display the throughput of any compactible system.
- Knowledge to connect with third party software and hardware.

Course Outcomes: After completion of the course the student is able to:

- Create Virtual Instrument using LabVIEW software for Control system, Signal Processing and Image processing applications.
- Create effective Virtual Instrument that shall use minimum memory space and work effectively with any processor.
- Interface the computer with DAQ to monitor, process and control real world applications
- Analyze the throughput using the tools in LabVIEW software

UNIT - I

An introduction

Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT - II

VI programming techniques

VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, mathscript.

UNIT - III

VI Interface requirements

Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI, VISA and IVI, Data Acquisition Hardware

UNIT - IV

Application of Virtual Instrumentation

Application of Virtual Instrumentation: Instrument Control using RS-232C and IEEE488, Development of Virtual Instrument using GUI, Real-time systems, Embedded Controller, OPC, Active X programming, Publishing measurement data in the web.

UNIT - V

VI toolsets

Distributed I/O modules, Control Design and Simulation, Digital Signal processing tool kit, Image acquisition and processing, Motion control

TEXT BOOKS:

1. LabVIEW Graphical Programming, Gary Johnson, Second edition, McGraw Hill, New York, 1997.
2. LabVIEW for everyone, Lisa K. wells & Jeffrey Travis Prentice Hall, New Jersey, 1997.

REFERENCE BOOKS:

1. Kevin James, PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control, Newnes, 2000.
2. Rick Bitter, LabVIEW advanced programming technique, 2nd Edition, CRC Press, 2005
3. Jovitha Jerome, Virtual Instrumentation using LabVIEW, 1st Edition, PHI, 2001.

EC600OE: FUNDAMENTALS OF INTERNET OF THINGS (Open Elective – I)

B.Tech. ECE III Year II Semester

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to:

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

- 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.

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 Arduino.

UNIT – III

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

UNIT - IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics.

UNIT - V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, 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

REFERENCE BOOKS:

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

EC700OE: ELECTRONIC SENSORS (Open Elective - II)

B.Tech. ECE IV Year I Semester

L	T	P	C
3	0	0	3

Course Objectives:

- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

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

- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT - I

Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT - II

Thermal Sensors: Introduction ,Gas thermometric Sensors ,Thermal Expansion Type Thermometric Sensors ,Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors ,Helium Low Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors

UNIT- III

Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT - IV

Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, X-ray and Nuclear Radiation Sensors, Fibre Optic Sensors

Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT - V

Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation

Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

TEXT BOOKS:

1. “Sensors and Transducers - D. Patranabis” –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press, 2011

REFERENCE BOOKS:

1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2nd Ed. TMH, 2009

EC800OE: MEASURING INSTRUMENTS (Open Elective - III)

B.Tech. ECE IV Year II Semester

L	T	P	C
3	0	0	3

Course Objectives:

- To provide basic knowledge in transduction principles, sensors and transducer technology and measurement systems.
- To provide better familiarity with the concepts of Sensors and Measurements.
- To provide the knowledge of various measurement methods of physical parameters like velocity, acceleration, force, pressure and viscosity.

Course Outcomes: After Completion of the course the student is able to

- Able to identify suitable sensors and transducers for real time applications.
- Able to translate theoretical concepts into working models.
- Able to understand the basic of measuring device and use them in relevant situation.

UNIT - I

Introduction to measurements. Physical measurement. Forms and methods of measurements. Measurement errors. Statistical analysis of measurement data. Probability of errors. Limiting errors. Standards. Definition of standard units. International standards. Primary standards. Secondary standards. Working standards. Voltage standard. Resistance standard. Current standard. Capacitance standard. Time and frequency standards.

UNIT - II

Passive Sensors

Resistive Sensors: Potentiometers, Strain Gages, Resistive Temperature Detectors (RTDs), Thermistors, Light-dependent Resistors (LDRs), Resistive Hygrometers, **Capacitive Sensors:** Variable capacitor, Differential capacitor, **Inductive Sensors:** Reluctance variation sensors, Eddy current sensors

UNIT - III

Metrology: Measurement of length – Plainness – Area – Diameter – Roughness – Angle – Comparators – Gauge Blocks. Optical Methods for length and distance measurements.

Velocity and Acceleration Measurement: Relative velocity – Translational and Rotational velocity measurements – Revolution counters and Timers - Magnetic and Photoelectric pulse counting stroboscopic methods. Accelerometers- different types, Gyroscopes-applications.

UNIT - IV

Force and Pressure Measurement: Gyroscopic Force Measurement – Vibrating wire Force transducer. Basics of Pressure measurement –Manometer types – Force-Balance and Vibrating Cylinder Transducers – High- and Low-Pressure measurement

UNIT - V

Flow, Density and Viscosity Measurements: Flow Meters- Head type, Area type (Rota meter), electromagnetic type, Positive displacement type, Density measurements – Strain Gauge load cell method – Buoyancy method.

Units of Viscosity, Two float viscorator –Industrial consistency meter

TEXT BOOKS:

1. Measurement Systems – Applications and Design – by Doeblin E.O., 4/e, McGraw Hill International, 1990.
2. Principles of Industrial Instrumentation – Patranabis D. TMH. End edition 1997

REFERENCE BOOKS:

1. Sensor Technology Hand Book – Jon Wilson, Newne 2004.
2. Instrument Transducers – An Introduction to their Performance and design – by Herman K.P. Neubrat, Oxford University Press.
3. Measurement system: Applications and Design – by E.O. Doeblin, McGraw Hill Publications.
4. Electronic Instrumentation by H.S. Kalsi.

EE600OE: RELIABILITY ENGINEERING (Open Elective – I)

B.Tech. EEE III Year II Sem

L	T	P	C
3	0	0	3

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

REFERENCE BOOKS:

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.

EE601OE: RENEWABLE ENERGY SOURCES (Open Elective – I)

B.Tech. EEE III Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites: None

Course Objectives:

- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods
- To detect about environmental effects of energy conversion

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

- Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
- Assess the cost of generation for conventional and renewable energy plants
- Design suitable power controller for wind and solar applications
- Analyze the issues involved in the integration of renewable energy sources to the grid

UNIT - I

Introduction

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs –Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

Wind Power Plants

Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated - General Classification of Wind Turbines-Rotor Turbines-Multiple-Blade Turbines Drag Turbines -Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT - II

Photovoltaic Power Plants

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

Fuel Cells: The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells –Reformers-Electro-lyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit-Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT - III

Induction Generators

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self-Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control - Economical Aspects.

UNIT - IV

Storage Systems

Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage - Storage Heat -Energy Storage as an Economic Resource.

UNIT - V

Integration of Alternative Sources of Energy

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Interconnection of Alternative Energy Sources with the Grid:

Interconnection Technologies - Standards and Codes for Interconnection - Interconnection Considerations - Interconnection Examples for Alternative Energy Sources.

TEXT BOOKS:

1. Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide for Beginners, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS:

1. D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

EE700OE: UTILIZATION OF ELECTRICAL ENERGY (Open Elective - II)

B.Tech. EEE IV Year I Sem

L	T	P	C
3	0	0	3

Pre-requisites: Electrical Machines-I and Electrical Machines-II

Course Objectives: Objectives of this course are

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

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

- Understand basic principles of electric heating and welding.
- Determine the lighting requirements for flood lighting, household and industrial needs.
- Calculate heat developed in induction furnace.
- Evaluate speed time curves for traction

UNIT - I

Electrical Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT - II

Electric Welding: Electric welding equipment, resistance welding and arc welding, comparison between AC and DC welding. Electrolysis process: principle of electrolysis, electroplating, metal extraction and metal processing, electromagnetic stirs.

UNIT - III

Illumination: Terminology, Laws of illumination, coefficient of Utilization and depreciation, Polar curves, Photometry, integrating sphere, sources of light, fluorescent lamps, compact fluorescent lamps, LED lamps discharge lamps, mercury vapor lamps, sodium vapor lamps and neon lamps, comparison between tungsten filament lamps and fluorescent tubes. Basic principles of light control, Types and design of lighting scheme, lighting calculations, factory lighting, street lighting and flood lighting.

UNIT - IV

Electric Traction: Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems, problems of single-phase traction with current unbalance and voltage unbalance. Mechanics of traction movement, speed – time curves for different services, trapezoidal and quadrilateral speed – time curves, tractive effort, power, specific energy consumption, effect of varying acceleration and braking, retardation, adhesive weight and braking retardation, coefficient of adhesion.

UNIT - V

Systems of Train Lighting: special requirements of train lighting, methods of obtaining unidirectional polarity constant output- single battery system, Double battery parallel block system, coach wiring, lighting by making use of 25KV AC supply.

TEXT BOOKS:

1. H. Partab: Modern Electric Traction, Dhanpat Rai & Co, 2007.
2. E. Openshaw Taylor: Utilization of Electric Energy, Orient Longman, 2010.

REFERENCE BOOKS:

1. H. Partab: Art & Science of Utilization of Electric Energy, Dhanpat Rai & Sons, 1998.
2. N.V. Suryanarayana: Utilisation of Electrical power including Electric drives and Electric Traction, New Age Publishers, 1997.

EE701OE: ELECTRIC DRIVES AND CONTROL (Open Elective - II)

B.Tech. EEE IV Year I Sem

L	T	P	C
3	0	0	3

Pre-requisites: Electrical Machines-I, Electrical Machines-II, Power Electronics

Course Objectives:

- To understand basics of electric drives
- To know the dynamics and control of various drive mechanisms
- To know the principle of operations of DC and AC motor drives
- To understand the energy conversion in electric drives

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

- Understand the various drive mechanisms and methods for energy conservation.
- Apply power electronic converters to control the speed of DC motors and induction motors.
- Evaluate the motor and power converter for a specific application.
- Develop closed loop control strategies of drives

UNIT- I:

Introduction To Electric Drives: Electrical Drives, Advantages of Electric drives, Parts of Electrical Drives, Electric Motors, Power Modulators, Sources, Control unit, Choice of Electric Drives and Losses.

UNIT- II:

Dynamics Of Electrical Drives: Fundamental torque equation, components of load torque, load characteristics, modified torque equation, speed-torque convention & multi-quadrant operation. Equivalent values of drive parameters, load with rotational motion, loads with translational motion, measurement of moment of inertia, components of load torques, Nature and classification of load torque. Calculation of time and energy loss in transient operation, steady state stability, loads equalization.

Control Of Electrical Drives: Modes of operation, speed control and drive classifications, closed loop control of drives.

UNIT- III:

DC Motor Drives: Starting, Braking, Speed control of DC motors using single phase fully controlled and half controlled rectifiers. Three phases fully controlled and half controlled converter fed DC motor drives. Chopper controlled DC drives.

UNIT- IV:

Induction Motor Drives: Speed control using pole changing, stator voltage control, AC voltage controllers. Variable frequency and variable voltage control from inverter. Different types of braking, dynamic, regenerative and plugging.

UNIT- V:

Energy Conservation in Electric Drives: Losses in Electric drive systems, measurement of Energy conservation in Electric drives. Use of efficient converters, energy efficient operation of drives, Improvement of p.f., improvement of quality of supply, maintenance of motors

TEXT BOOKS:

1. G.K. Dubey: Fundamentals of Electric Drives –Narosa Publishers, Second edition, 2007.
2. Vedam Subramanyam: Electric Drives Concepts & Applications –Tata McGraw Hill Edn. Pvt. Ltd, Second edition 2011.

REFERENCE BOOKS:

1. NisitK. De and Prashanta K. Sen: Electric Drives, PHI., 2001
2. V. Subrahmanyam: Thyristor Control of Electric Drives, Tata McGraw Hill Edn. Pvt. Ltd, 2010.
3. Werner Leonhard: Control of Electric Drives, Springer international edition 2001.
4. NisitK. De and Swapan K. Dutta: Electric Machines and Electric Drives, PHI learning Pvt. Ltd 2011

EE800OE: BASICS OF POWER PLANT ENGINEERING (Open Elective - III)

B.Tech. EEE IV Year II-Sem

L	T	P	C
3	0	0	3

Prerequisite: Power System-I

Course Objectives: To provide an overview of power plants and the associated energy conversion issues

Course Outcomes: Upon completion of the course, the students can understand the principles of operation for different power plants and their economics

UNIT - I

Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

UNIT - II

Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT - III

Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.

UNIT - IV

Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems

UNIT - V

Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

TEXT BOOKS:

1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOK:

1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

EE801OE: ENERGY SOURCES AND APPLICATIONS (Open Elective - III)

B.Tech. EEE IV Year II-Sem

L	T	P	C
3	0	0	3

Pre-requisites: None

Course Objectives:

- To introduce various types of energy sources available.
- The technologies of energy conversion from these resources and their quantitative analysis.
- To know the applications of various energy sources

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

- List and generally explain the main sources of energy and their primary applications nationally and internationally
- Understand the energy sources and scientific concepts/principles behind them
- Understand effect of using these sources on the environment and climate
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
- List and describe the primary renewable energy resources and technologies.
- To quantify energy demands and make comparisons among energy uses, resources, and technologies.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
- Understand the Engineering involved in projects utilizing these sources

UNIT - I

Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

UNIT - II

Energy Sources: Overview of energy systems, sources, transformations efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) -past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar nuclear, wave, tidal and hydrogen;

UNIT - III

Sustainability and Environmental Trade-Offs Of Difference Energy Systems: Possibilities for energy storage or regeneration (Ex. Pumped storage hydro Power projects, superconductor-based energy storages, high efficiency batteries)

UNIT - IV

Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic environmental, trade, and research policy.

UNIT - V:

Engineering for Energy Conservation: Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated) *LEED ratings;* Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

TEXT BOOKS:

1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press.

REFERENCE BOOKS:

1. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam.
2. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII.
3. Ristinen, Robert A. Kraushaar, Jack J. A Kraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment.
4. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company.
5. Related papers published in international journals.

ME600OE: QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS (Open Elective – I)

B.Tech. Mech. Engg. III Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the problem, identifying decision variables, objective and constraints
- Formulation of Optimization Problem by constructing Objective Function and Constraints functions
- Learn to select appropriate Optimization Technique for the formulated Optimization Problem
- Understood the procedure involved in the selected Optimization Technique
- Solve the Optimization Model with the selected Optimization Technique

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

- Familiar with issues that would crop up in business
- Able to formulate Mathematical Model to resolve the issue
- Able to select technique for solving the formulated Mathematical Model
- Able to analyze the results obtained through the selected technique for implementation.

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 Queing models with FCFS Queue disciplne: 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

REFERENCE BOOKS:

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.
6. Quantitative Techniques/ Selvaraj/ Excel, 2009
7. Quantitative Techniques for Decision Making / Gupta and Khanna/ PHI, 2009.
8. Operations Research/ Ravindran, Phillips, Solberg/ Wiley, 2009.
9. Quantitative Methods for Business/ Anderson, Sweeney, Williams/ 10/e, Cengage, 2008

ME700OE: BASIC MECHANICAL ENGINEERING (Open Elective – II)

B.Tech. Mech. Engg. IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives

- To gain an understanding of the basic concepts of various aspects of Mechanical Engineering, fields of application, their merits, demerits, and limitations and applications.

UNIT - I

Basic Concepts of Thermodynamics and Heat Transfer: Definitions – continuum concept – properties – point and path functions – systems – processes – thermodynamic equilibrium - laws of thermodynamic- First law applied to open and closed systems – steady and unsteady flow systems - Second law – heat engines and heat pumps – efficiency and Coefficient of Performance (COP).

Heat transfer – conduction – general conduction equation in Cartesian coordinates – conduction in composite walls. Convection – free and forced convection – simple empirical correlations. Radiation – laws – black body and grey body radiation.

UNIT - II

IC Engines and Air Conditioning: I C engines – classification - construction and working - two and four stroke engines – S I and C.I. engines – powdered coal as an alternative to diesel fuel.

Air conditioning – air cycles, vapour compression cycle – vapour absorption cycle – psychrometric processes. Air cooling – methods and simple cooling load calculations. Systems applicable to mining environment.

UNIT - III

Power Transmission: Gears – nomenclature, laws of gearing, types of gears including rack and pinion, interference, gear trains, calculation of gear ratios, couplings - types, features and applications.

Basic concepts in hydraulic & pneumatic power and devices and their utilisation – simple calculations.

UNIT - IV

Kinematics of Machines: Mechanisms – basics – kinematic concepts and definitions – degree of freedom, mechanical advantage – transmission angle – description of common mechanisms – quick return mechanisms, straight line generators, dwell mechanisms, ratchets and escapements – universal joints.

Cams and followers – terminology and definitions, displacement diagrams – uniform velocity, parabolic and simple harmonic motions.

UNIT - V

Rotodynamic and Vibratory Machines: Fans and compressors – types, construction, working principle, characteristics and applications. Single stage and multistage air compressors – intercooling. Simple calculations for output and efficiency.

Vibration – Importance of free and forced vibration. Vibrators and shakers – construction, working principle, applications and limitations.

Note: HMT Data book to be permitted

TEXT BOOKS:

1. Elements of Mechanical Engineering/ S.N. Lal/ Cengage Learning
2. Theory of Machines and Mechanisms / Shigley J.E., Pennock G.R. and Uicker J. J./ Oxford University Press, 2003.

REFERENCE BOOKS:

1. Rajput, R.K. Thermal Engineering, 6th Edition, Laxmi Publications, 2007
2. Ballaney, P.L. Thermal Engineering, Khanna Publishers, 24th Edition, 2003

ME800OE: NON-CONVENTIONAL SOURCES OF ENERGY (Open Elective – III)

B.Tech. Mech. Engg. IV Year II Sem.

L	T	P	C
3	0	0	3

Pre-requisites: None

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

- Identify renewable energy sources and their utilization. Understand the basic concepts of solar radiation and analyze the working of solar and thermal systems.
- Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, biogas and hydrogen.
- Understand the concepts and applications of fuel cells, thermoelectric convertor and MHD generator.
- Identify methods of energy storage for specific applications

UNIT – I

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power - Physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT - II

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating/cooling techniques, solar distillation and drying, photovoltaic energy conversion.

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

UNIT - III

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of biogas, utilization for cooking, I.C. Engine operation, and economic aspects.

UNIT - IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy – OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles. Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants, their economics.

UNIT –V

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, Principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principle, faraday's laws, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai/ Khanna Publishers
3. Biological Energy Resources/ Malcolm Fleischer & Chris Lawis/ E&FN Spon.

REFERENCE BOOKS:

1. Renewable Energy Sources / Twidell & Weir
2. Solar Power Engineering / B.S. Magal Frank Kreith & J.F. Kreith
3. Principles of Solar Energy / Frank Krieth & John F Kreider
4. Non-Conventional Energy / Ashok V Desai / Wiley Eastern
5. Non-Conventional Energy Systems / K Mittal / Wheeler
6. Renewable Energy Technologies / Ramesh & Kumar / Narosa

ME600OE: QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS (Open Elective – I)

B.Tech. AE III Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Understand the problem, identifying decision variables, objective and constraints
- Formulation of Optimization Problem by constructing Objective Function and Constraints functions
- Learn to select appropriate Optimization Technique for the formulated Optimization Problem
- Understood the procedure involved in the selected Optimization Technique
- Solve the Optimization Model with the selected Optimization Technique

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

- Familiar with issues that would crop up in business
- Able to formulate Mathematical Model to resolve the issue
- Able to select technique for solving the formulated Mathematical Model
- Able to analyze the results obtained through the selected technique for implementation.

UNIT – I:

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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.

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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.

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REFERENCE BOOKS:

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.
6. Quantitative Techniques/ Selvaraj/ Excel, 2009
7. Quantitative Techniques for Decision Making / Gupta and Khanna/ PHI, 2009.
8. Operations Research/ Ravindran, Phillips, Solberg/ Wiley, 2009.
9. Quantitative Methods for Business/ Anderson, Sweeney, Williams/ 10/e, Cengage, 2008

AE700OE: BASICS OF AERONAUTICAL ENGINEERING (Open Elective – II)

B.Tech. AE IV Year I Sem.	**L**	**T/P/D**	**C**
	3	**0/0/0**	**3**

Pre-Requisites: Nil

Course Objectives:

- Fundamental principle of airplane
- Theoretical Aerodynamics
- Aircraft application based on speed

Course Outcomes:

- Basic aerodynamic mechanics
- Effect of flow over wings

UNIT - I

Laws and Definitions: List the SI-units of measurement for mass, acceleration, weight, velocity, density, temperature, pressure, force, wing loading and power. - Define mass, force, acceleration and weight. - State and interpret Newton's Laws. - State and interpret Newton's first law. - State and interpret Newton's second law. - State and interpret Newton's third law.

Explain air density. - List the atmospheric properties that effect air density. - Explain how temperature and pressure changes affect density. - Define static pressure. - Define dynamic pressure. - Define the formula for dynamic pressure. - Apply the formula for a given altitude and speed. - State Bernoulli's equation. - Define total pressure. - Apply the equation to a Venturi. - Describe how the IAS is acquired from the pitot-static system. - Describe the relationship between density, temperature and pressure for air. - Describe the Equation of Continuity. - Define IAS, CAS, EAS, TAS

UNIT - II

Basics About Airflow: Describe steady and unsteady airflow. - Explain the concept of a streamline. - Describe and explain airflow through a stream tube. - Explain the difference between two and three-dimensional airflow.

UNIT - III

Aerodynamic Forces and Moments on Aerofoil: Describe the force resulting from the pressure distribution around an aerofoil. - Resolve the resultant force into the components 'lift' and 'drag'. - Describe the direction of lift and drag. - Define the aerodynamic moment. - List the factors that affect the aerodynamic moment. - Describe the aerodynamic moment for a symmetrical aerofoil. - Describe the aerodynamic moment for a positively and negatively cambered aerofoil. - Forces and equilibrium of forces - Define angle of attack.

UNIT - IV

Shape of an Aerofoil Section: Describe the following parameters of an aerofoil section: - leading edge. - trailing edge. - chord line. - thickness to chord ratio or relative thickness. - location of maximum thickness. - camber line. - camber. - nose radius. - Describe a symmetrical and an asymmetrical aerofoil section.

Wing shape: Describe the following parameters of a wing: - span. - tip and root chord. - taper ratio. - wing area. - wing planform. - mean geometric chord. - mean aerodynamic chord MAC. - aspect ratio. - dihedral angle. - sweep angle. - wing twist: - geometric. - aerodynamic. - angle of incidence.

UNIT - V

Subdivision of Aerodynamic Flow: List the subdivision of aerodynamic flow: - subsonic. - transonic. - supersonic flow. - Describe the characteristics of the flow regimes listed above. - Airplane for different speed and their applications.

TEXT BOOKS:

1. Stephen. A. Brandt, "Introduction to Aeronautics: A design perspective" American Institute of Aeronautics & Astronautics, 1997
2. Kermode, A.C., “Mechanics of Flight”, Himalayan Book, 1997

REFERENCE BOOK:

1. Anderson, J.D., “Introduction to Flight”, McGraw-Hill, 1995.

AE800OE: ELEMENTS OF ROCKET PROPULSION (Open Elective – III)

B.Tech. AE IV Year II Sem.	**L**	**T/P/D**	**C**
	3	**0/0/0**	**3**

Pre-Requisites: High Speed Aerodynamics

Course Objectives:

- To study the basic principles and applications of rocket propulsion
- To know the choice of propellants and basic performance parameters in chemical propellants and propulsion systems
- To know the electric rocket propulsion and advanced rocket propulsion techniques.

Course Outcomes:

- Working principle of rockets
- Different types of propulsion system

UNIT – I

Fundamentals of Rocket Propulsion: History and evolution of rockets. Rocket equation, Definitions. Performance parameters, Staging and Clustering, Classification of rockets. Rocket nozzle and performance, Nozzle area ratio, conical nozzle and contour nozzle, Under and over expanded nozzles. Flow separation in nozzles, unconventional nozzles. Mass flow rate, Characteristic velocity, Thrust coefficient, Efficiencies, Specific impulse. Numerical problems.

UNIT – II

Chemical Propellants: Molecular mass, specific heat ratio, Energy release during combustion, Stoichiometry & mixture ratio, Criterion for choice of propellant, Solid propellants, requirement, composition and processing. Liquid propellants, energy content, storability, Types and classifications. Numerical problems

UNIT - III

Solid Propulsion Systems: Classifications- Booster stage and upper stage rockets. Hardware components and functions. Propellant grain configuration and applications. Burn rate, burn rate index for stable operation, mechanism of burning, ignition and igniters types. Action time and burn time. Factors influencing burn rates. Thrust vector control. Numerical problems.

UNIT - IV

Liquid Propulsion Systems: Classifications- Booster stage and upper stage rockets. Hardware components and functions. Thrust chamber and its cooling, injectors and types, Propellant feed systems. Turbo pumps. Bi - propellant rockets. Mono propellant thrusters, Cryogenic propulsion system, special features of cryogenic systems. Numerical problems.

UNIT - V

Advance Propulsion Techniques: Hybrid propellants and gelled propellants. Electrical rockets, types and working principle. Nuclear rockets, Solar sail, Concepts of some advance propulsion systems. Numerical problems.

TEXT BOOKS:

1. Ramamurthi. K: Rocket propulsion. Macmillan Publishing Co, India. First edition. 2010.
2. Hill. P.G. and Peterson. C.R: Mechanics and thermodynamics of propulsion. 2nd edition. Pearson Education. 1999.

REFERENCE BOOK:

1. Sutton. G.P. and Biblarz. O.: Rocket propulsion elements. Wiley India Pvt Ltd. 7th edition 2003.

MT600OE: INDUSTRIAL MANAGEMENT (Open Elective – I)

B.Tech. Mechatronics III Year II Sem.

L	T	P	C
3	0	0	3

UNIT- I

Introduction to Management: Entrepreneurship and organization – Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

UNIT - II

Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT - III

Operations Management: Objectives- product design process- Process selection-Types of production system(Job, batch and Mass Production),Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing(RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram

UNIT - IV:

Work Study: Introduction — definition — objectives — steps in work study — Method study — definition, objectives — steps of method study. Work Measurement — purpose — types of study — stop watch methods — steps — key rating — allowances — standard time calculations — work sampling.

Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes- Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

UNIT - V

Job Evaluation: Methods of job evaluation — simple routing objective systems — classification method factor comparison method, point method, benefits of job evaluation and limitations. **Project Management (PERT/CPM):** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

TEXT BOOKS

1. Industrial Engineering and Management/O.P. Khanna/Khanna Publishers.
2. Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma /Khanna Publishers.

REFERENCE BOOKS

1. Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by ILO.
2. Human factors in Engineering & Design/Ernest J McCormick /TMH.
3. Production & Operation Management /Paneer Selvam/PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Hand Book/Maynard.
6. Industrial Engineering Management I Ravi Shankar/ Galgotia.

MT601OE: NON-CONVENTIONAL ENERGY SOURCES (Open Elective – I)

B.Tech. Mechatronics III Year II Sem.

L	T	P	C
3	0	0	3

UNIT – I

Principles Of Solar Radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

UNIT-III

Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-IV

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

UNIT-V

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar/Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal/Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal/Wheeler
4. Solar Energy/Sukhame

MT700OE: INTELLECTUAL PROPERTY RIGHTS (Open Elective - II)

B.Tech. Mechatronics IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT - II

Trade Marks: Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT - III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT - IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, False advertising.

UNIT - V

New development of intellectual property: New developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international - trade mark law, copy right law, international patent law, international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, Tata Mc Graw Hill Publishing Company Ltd.

MT701OE: PRINCIPLES OF ENTREPRENEURSHIP (Open Elective – II)

B.Tech. Mechatronics IV Year I Sem.

L	T	P	C
3	0	0	3

UNIT - I

Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs Manager, creating and starting the venture: sources of new ideas, method of generating ideas, creative problem solving – writing business plan, evaluating business plans. Launching formalities.

UNIT - II

Financing and Managing the new ventures: sources of capital, record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E commerce and Entrepreneurship, internet advertising – new venture expansion strategies and issues.

UNIT - III

Industrial Financial Support: schemes and functions of directorate of industries, District industries centre (DICs) Industrial development corporation (IDC), State Financial corporation (SFCs), small scale industries development corporation (SSIDCs) Khadhi and village industries commission (KVIC) Technical Consultancy organisation (TCO), Small industries service institute (SISI), national small industries corporation (NSIC), small industries development bank of india (SIDBI).

UNIT - IV

Production and marketing management: Thrust areas of production management, selection of production techniques, plant utilisation and maintenance, designing the work place, inventory control, material handling and quality control. Marketing functions, market segmentation market research and channels of distribution, sales promotion and product pricing.

UNIT - V

Labour legislation, salient provision of health, safety, and welfare under Indian factories Act, Industrial dispute act, employees state insurance act, workmen's compensation act and payment of bonus act .

TEXT BOOKS:

1. Robert Hisrich, & Michael Peters: Entrepreneurship, TMH, 2009.
2. Dollinger: Entrepreneurship, Pearson, 2009.

REFERENCE BOOKS:

1. Vasant Desai, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2009.
2. Harvard Business Review on Entrepreneurship, HBR Paper Back.
3. Robert J. Calvin: Entrepreneurial Management, TMH, 2009.
4. Gurmeet Naroola: The entrepreneurial Connection, TMH, 2009.
5. Bolton & Thompson: Entrepreneurs—Talent, Temperament and Techniques, Butterworth Heinemann, 2009.
6. Agarwal: Indian Economy, Wishwa Prakashan 2009.
7. Dutt & Sundaram: Indian Economy, S. Chand, 2009.
8. B D Singh.: Industrial Relations & Labour Laws, Excel, 2009.
9. Aruna Kaulgud: Entrepreneurship Management by, Vikas publishing house, 2009.
10. Essential of entrepreneurship and small business management by Thomas W. Zimmerer & Norman M. Searborough, PHI-2009.
11. ND Kapoor: Industrial Law, Sultan Chand & Sons, 2009.

MT702OE: BASIC MECHANICAL ENGINEERING (Open Elective - II)

B.Tech. Mechatronics IV Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives: To gain an understanding of the basic concepts of various aspects of Mechanical Engineering, fields of application, their merits, demerits, and limitations and applications.

UNIT - I

Basic Concepts of Thermodynamics and Heat Transfer: Definitions – continuum concept – properties – point and path functions – systems – processes – thermodynamic equilibrium - laws of thermodynamic- First law applied to open and closed systems – steady and unsteady flow systems - Second law – heat engines and heat pumps – efficiency and Coefficient of Performance (COP).
Heat transfer – conduction – general conduction equation in Cartesian coordinates – conduction in composite walls. Convection – free and forced convection – simple empirical correlations. Radiation – laws – black body and grey body radiation.

UNIT - II

IC Engines and Air Conditioning: I C engines – classification - construction and working - two and four stroke engines – S I and C.I. engines – powdered coal as an alternative to diesel fuel.
Air conditioning – air cycles, vapour compression cycle – vapour absorption cycle – psychrometric processes. Air cooling – methods and simple cooling load calculations. Systems applicable to mining environment.

UNIT - III

Power Transmission: Gears – nomenclature, laws of gearing, types of gears including rack and pinion, interference, gear trains, calculation of gear ratios, couplings - types, features and applications.
Basic concepts in hydraulic & pneumatic power and devices and their utilization – simple calculations.

UNIT - IV

Kinematics of Machines: Mechanisms – basics – kinematic concepts and definitions – degree of freedom, mechanical advantage – transmission angle – description of common mechanisms – quick return mechanisms, straight line generators, dwell mechanisms, ratchets and escapements – universal joints. Cams and followers – terminology and definitions, displacement diagrams – uniform velocity, parabolic and simple harmonic motions.

UNIT - V

Rotodynamic and Vibratory Machines: Fans and compressors – types, construction, working principle, characteristics and applications. Single stage and multistage air compressors – intercooling. Simple calculations for output and efficiency. Vibration – Importance of free and forced vibration. Vibrators and shakers – construction, working principle, applications and limitations.

Note: HMT Data book to be permitted

TEXT BOOKS:

1. Rajput, R.K. Thermal Engineering, 6th Edition, Laxmi Publications, 2007
2. Ballaney, P.L. Thermal Engineering, Khanna Publishers, 24th Edition, 2003
3. Shigley J.E., Pennock G.R. and Uicker J.J. Theory of Machines and Mechanisms, Oxford University Press, 2003.

REFERENCE BOOKS:

1. Domkundwar, Kothandaraman, and Domkundwar. A Course in Thermal Engineering, Dhanpat Raj & Sons, Fifth edition, 2002.

2. Yunus A. Cengel. Heat Transfer - A Practical Approach – Tata Mc Graw Hill 2004.
3. Nag, P.K. Engineering Thermodynamics, 3rd Edition, Tata Mc Graw Hill, 2005
4. Thomas Bevan. Theory of Mechanics, CBS Publishers and Publishers and Distributers, 1984.

MT800OE: FUNDAMENTALS OF ROBOTICS (Open Elective - III)

B.Tech. Mechatronics IV Year II Sem.

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Brief history, Classification of robot, Elements of robots joints, links, actuators, and sensors

UNIT – II

Components of the Industrial Robotics: Position and orientation of a rigid body, Homogeneous transformations, Introduction to D-H parameters and its physical significance, Orientation of Gripper, Direct and inverse kinematics serial robots, Examples of kinematics of common serial manipulators.

UNIT – III

Principles of Robot Control: Planning of trajectory, Calculation of a link velocity and acceleration, Calculation of reactions forces, Trajectory-following control.

UNIT – IV

Robot programming: Robot programming methods, Robot programming languages, Requirements of a programming robots system, The robot as a multitasking system: Flow Control, Task Control.

UNIT – V

System integration and robotic applications: Robot system integration, Robotic applications.

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robot technology fundamentals / James G. Keramas / Cengage Publications

REFERENCE BOOKS:

1. Introduction to Robotics / John J Craig / Pearson Edu.
2. Applied Robotics / Edwin Wise / Cengage Publications.
2. Robotics / Fu K S / McGraw Hill.
3. Robotic Engineering / Richard D. Klafter, Prentice Hall.
4. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.
5. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

MT801OE: LINEAR AND NON-LINEAR OPTIMIZATION TECHNIQUES (Open Elective - III)

B.Tech. Mechatronics IV Year II Sem.

L	T	P	C
3	0	0	3

UNIT - I

Linear Programming: Introduction and need for optimization in engineering design, formulating linear programs, graphical solution of linear programs, special cases of linear programming.

UNIT - II

The Simplex Method: Converting a problem to standard form, the theory of the simplex method, the simplex algorithm, special situations in the simplex algorithm, obtaining initial feasible solution.

UNIT - III

Duality and Sensitivity Analysis: Sensitivity analysis, shadow prices, dual of a normal linear program, duality theorems, dual simplex method. Integer Programming: Formulating integer programming problems, the branch-and-bound algorithm for pure integer programs, the branch-and bound algorithm for mixed integer programs.

UNIT - IV

Non-linear Programming: Introduction to non-linear programming (NLP), Convex and concave functions, NLP with one variable, Line search algorithms, Multivariable unconstrained problems, constrained problems, Lagrange Multiplier, The Karush-Kuhn-Tucker (KKT) conditions, the method of steepest ascent, convex combination method, penalty function, Quadratic programming,

UNIT - V

Dynamic programming: Evolutionary algorithms: Genetic Algorithm, concepts of multiobjective optimization, Markov Process, Queuing Models.

TEXT BOOK:

1. S.S. Rao, Engineering Optimization: Theory and Practice, Wiley & Sons, New Jersey, 2009.

REFERENCE BOOKS:

1. F.H. Hiller and G.J. Liberman, Introduction to Operations Research, Tata-McGraw-Hill, 2010.
2. W.L. Winston, Operations Research: Applications and Algorithm, 4th Edition, Cengage Learning, 1994.
3. K. Deb, Optimization for Engineering Design, Prentice Hall, 2013.
4. M.C. Joshi and K. M. Moudgalay, Optimization: Theory and Practice, Narosa, 2004.

MT802OE: TOTAL QUALITY MANAGEMENT (Open Elective - III)

B.Tech. Mechatronics IV Year II Sem.

L	T	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

ISO 9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQC Q- 90. Series Standards, benefits of ISO 9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS:

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

REFERENCE BOOKS:

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.
5. Total Engineering Quality Management/Sunil Sharma/Macmillan.

PE600OE: GENERAL GEOLOGY

B.Tech. Petroleum Engg. III Year II Sem.	L	T/P/D	C
	3	0/0/0	3

Prerequisites: None

Course Objective: To expose the students to different geological environments, which relate to petroleum industry

Course Outcome: The student would understand the basics of geology, viz: formation of earth, layers of earth, different types of rocks, formation of sedimentary basins and the micro fossils and their relationship to oil and gas.

UNIT - I

Dimensions of earth, structure, composition and origin of earth-envelops of the Earth- crust, mantle, core. Internal dynamic process- Plate tectonics- continental drift, Earthquake and volcanoes. External dynamic process- weathering, erosion and deposition.

UNIT - II

Fundamental concepts in Geomorphology-geomorphic processes distribution of landforms-drainage patterns –development, Landforms in relation to rocks types, paleochannels, buried channels.

UNIT - III

Geological work of rivers, wind, Ocean and glaciers and the landforms created by them.

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UNIT - IV

Origin of igneous, sedimentary and metamorphic rocks. Sedimentary structures-petrographic character of conglomerate, sandstone, shale, limestones.

Introduction to sedimentary basins and deltaic systems. Topographic maps, thematic maps, Topographic and thematic profiles.

UNIT - V

Palaeontology: Introduction to Palaeontology, Fossils and Fossilization.

Micropaleontology - Palynology: Distribution of microfossils-Foraminifera, Radiolaria, Conodonts, Ostracodes, Diatoms. Importance of micro fossils in oil exploration.

TEXT BOOK:

1. Engineering Geology, F. G. Bell, 2nd Edition, Butterworth Heimann, 2007.

REFERENCE BOOKS:

1. Text book of Geology, P. K Mukharjee, The World Press Pvt Ltd., Calcutta, 2005.
2. Rutleys Elements of Mineralogy, 27 Ed., N. H. Read, Allen & Unwin Australia 1988.

PE700OE: NATURAL GAS ENGINEERING (Open Elective – II)

B.Tech. Petroleum Engg. IV Year I Sem.	L	T/P/D	C
	3	0/0/0	3

Course Objectives

- To learn and be able to apply the basic quantitative tools of reservoir and production engineering techniques to analyze and/or predict the mechanics of natural gas flow through the reservoir–production-transportation system.
- To understand the importance of evaluating and managing the reservoir-production system of gas reservoirs.
- To familiarize with various principles/ involved in natural gas engineering.

Course Outcomes: The students would be able to

- Understand basic fluid phase behavior, and be able to determine the physical properties of natural gas.
- Able to use volumetric method, material balance equation and decline curves to perform reserves and performance prediction/enhancement of dry and wet gas reservoirs.

UNIT- I

Basics of Natural Gas: Natural Gas Origin-Accumulation-Natural Gas Resources- Natural Gas Composition & Phase Behavior- Natural Gas Properties.
Unique Issues in Natural Gas Exploration, Drilling & Well Completion

UNIT- II

NG Production: Darcy and non-Darcy flow in porous media, Gas well inflow under Darcy flow-Gas well inflow under non-Darcy flow- Horizontal Gas well inflow-Hydraulic fracturing- well deliverability-forecast of well performance and material balance

UNIT- III

Natural Gas Transportation- properties and compressed natural gas.
Natural gas pipelines- marine compressed natural gas transportation.

UNIT- IV

Liquefied Natural Gas (LNG): LNG liquefaction- LNG carrier
Gas to liquids (GTL): GTL process – GTL based on direct conversion of natural gas – GTL based indirect conversion natural gas- GTL Economics

UNIT - V

Underground Natural Gas storage: Types of underground storage- storage measures
Natural gas supply, alternative energy sources and the environment: Advantages of fossil fuels, energy interchangeability-Regional gas supply potential

TEXT BOOK:

1. Advanced natural gas engineering, Xiuli Wang and Michael Economides, Gulf publishing company, Houston, Texas, 2009.

REFERENCE BOOK:

1. Handbook of Natural Gas Engineering, D. L. Katz, McGraw Hill, 1959.

PE800OE: GREEN FUEL TECHNOLOGIES (Open Elective – III)

B.Tech. Petroleum Engg. IV Year II Sem.	L	T/P/D	C
	3	0/0/0	3

Course Objective: This course is designed with an objective to develop basic understanding of renewable and clean energy bio-fuels and their engineering aspects.

Course Outcomes: The students would learn about the importance of bio-fuels in achieving energy security and minimizing greenhouse gases emissions, the overview of available renewable and alternative clean energy sources like biomass resources, types of bio-fuels.

UNIT- I

Introduction – Plant based biofuels Scenario – Thermo chemical conversion of Biomass to liquids and Gaseous Fuels.

UNIT- II

Bioethanol from Biomass: Production of Ethanol from Molasses – Bioethanol form Starchy Biomass: Production of Starch Saccharifying Enzymes – Hydrolysis and Fermentation. Bioethanol from Lignocellulosic Biomass

UNIT- III

Bioethanol production Technologies and Substrates- Biodiesel Production using Pongamia Pinnata, Jatropha, Palm oil and used oils.

UNIT- IV

Microbial production of Methane- Different Types of Bio-digesters and Biogas Technology in India

UNIT - V

Hydrogen production by Fermentation- Microbial fuel cells

TEXT BOOKS:

1. Hand book of plant Based Biofuels, Ashok Pandey, CRC Press. 2009.
2. Biofuels Engineering Process Technology, Caye M, Drapcho, Nghiem, Phu Nhuan, Terry H. Walker, McGraw-Hill, 2008.

MM600OE: TESTING OF MATERIALS (Open Elective – I)

B.Tech. (MME) III Year II Semester

L	T	P	C
3	0	0	3

Course Objectives:

- To gain and understanding of the response of various metals under the application of stress and/or temperature.
- To build necessary theoretical back ground of the role of lattice defects in governing both elastic and plastic properties of metals will be discussed.
- Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN.
- Obtain a working knowledge of creep and fatigue and analysis of data.

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

- Classify mechanical testing of ferrous and non-ferrous metals and alloys.
- Recognize the importance of crystal defects including dislocations in plastic deformation.
- Identify the testing methods for obtaining strength and hardness.
- Examine the mechanisms of materials failure through fatigue and creep.

UNIT - I

Introduction, Importance of testing Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell hardness tests. The Impact Test: Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve.

UNIT - II

The Tension Test: Engineering stress-strain and True stress-strain curves. Tensile properties, conditions for necking. Stress-Strain diagrams for steel, Aluminum and cast iron.

UNIT - III

Fatigue Test: Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, Effect of stress concentration, size, surface condition and environments on fatigue.

UNIT - IV

Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature.

UNIT - V

NDT: Principle, Operation, Advantages and Limitations of Liquid Penetrant, Magnetic Particle, Radiography and Ultrasonic tests.

TEXT BOOKS:

1. Mechanical Metallurgy – G. E. Dieter, Third edition, published by New York Mc GrawHill,1986.
2. Mechanical behavior - Ed. Wulf.

REFERENCE BOOKS:

1. Mechanical Metallurgy – White & Lemay.
2. Testing of Metallic Materials - A.V.K. Suryanarayana

MM601OE: ALLOY STEELS (Open Elective – I)

B.Tech. (MME) III Year II Semester

L	T	P	C
3	0	0	3

Course objectives:

- Low carbon, Medium carbon and High carbon steels with respect to structure property correlations and strengthening mechanisms with alloy additions.
- Ultra-high strength steels, Stainless steels and Tool steels with respect to heat treatment, properties and applications.

Course Outcomes:

- Ability to understand different types of alloys used in alloy steels.
- Ability to solve different metallurgical problems in alloy steels.
- It has a lot of scope in R&D and in automobile engineering.

UNIT - I

Low-carbon Mild steels: Introduction; cold forming steels, High strength packing steels; HSLA steels; Low-carbon Ferrite pearlite steels – structure property relation-ships, strengthening mechanisms, Formability of HSLA steels.

UNIT - II

Medium- High carbon ferrite-pearlite steels – structure property relationships, Bainitic steels; Low-Carbon bainitic steels-requirements, development and choice of alloying elements, Mechanical properties, microstructure and impact properties; High-Carbon bainitic steels.

UNIT - III

Ultra-high strength steels: Introduction, steels tempered at low temperatures, secondary hardening, thermo- mechanical treatments, rapid austenitizing treatments, structure-property relationships in tempered martensite, cold-drawn pearlite steels, maraging steels.

UNIT - IV

Stainless steels: Classification, Composition, Microstructures, Heat treatment an application.

UNIT - V

Tool steels and Heat resistant steels: Classification, Composition, Micro structure an Heat treatment and application.

TEXT BOOKS:

1. Physical Metallurgy and the Design of steels: F. B. Pickering, Applied Science publisher, London, 1978.
2. The physical Metallurgy of steels: W. C. Leslie by Hemisphere Publishers Corporation, 1981.

REFERENCE BOOKS:

1. Alloys Steels – Wilson.
2. Heat Treatment of steels – Rajan & Sharma

MM700OE: ENGINEERING MATERIALS (Open Elective – II)

B.Tech. (MME) IV Year I Semester

L	T	P	C
3	0	0	3

Course objectives:

- To gain knowledge in applications properties strengthening mechanisms in structural steels and super alloys and stainless steels
- To develop a fundamental understanding of various electrical and electronic materials
- To highlight the importance of bio materials.

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

- To select and design components based on their properties and requirements.
- Awareness about the electrical and electronic materials
- Knowledge about bio materials like, titanium and stainless steel based.

UNIT - I

Structural Steels: Introduction, Classification: HSLA steels, Dual phase steels, TRIP steels, Maraging steels, HSS steels.

UNIT - II

Superalloys: Introduction, Classification, Applications and properties of Ni, Fe, Co based superalloys and their thermo-mechanical treatments.

UNIT - III

Electrical and Electronic Materials: Introduction, Classification, Applications and properties of Pyro, Piezo, Ferro-electrics, Extrinsic and Intrinsic semiconductors; super conducting materials.

UNIT - IV

Stainless steels: Ferritic, Martensitic, Austenitic stainless steels.

UNIT - V

Bio materials: Introduction, Property requirements for biomaterials, concept of biocompatibility, important bio metallic alloys**.**

TEXT BOOK:

1. Superalloys-II edited by C.T. SIMS, N.S. Stoloff and W.C. Hagel A Wiley-Inter science publication John Wiley and sons, New York, 1972.

REFERENCE BOOKS:

1. An Introduction to Materials Science and Engineering, W. D. Callister, John Wiley & Sons (2007).
2. Materials Science and Engineering, V. Raghavan, PHI, 2004.

MM701OE: SURFACE ENGINEERING (Open Elective – II)

B.Tech. (MME) IV Year I Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course objectives: To understand the need for Surface Engineering and to become familiar with the techniques associated with Surface Engineering

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

- Indicate the need for surface engineering
- Indicate the different methods of surface engineering
- Differentiate between the methods used and indicate their relative merits
- Understand aspects associated with industrial applications of surface engineering

UNIT - I

Introduction to surface modification, need for surface modification, surface properties, surface property modification, history of surface modification

UNIT - II

Plating and coating process: concept of coating, types of coatings, properties of coatings, hard facing, anodizing, PVD, CVD, Electro deposition Electro less deposition, hot deposition, hot dipping.

UNIT - III

Thermo-chemical Processes: carburizing, nitriding, carbonitriding, nitro carburizing, Boronising, Plasma nitriding, thermal spraying, Plasma spraying.

UNIT - IV

Thermal Processes: hardening, tempering, laser hardening, laser surface alloying, laser cladding, electro beam hardening.

UNIT - V

General design principles related to surface engineering, design guidelines for surface preparation, surface engineering solution to specific problems.

TEXT BOOK:

1. Introduction to Surface Engineering, P. A. Dearnley, Cambridge University Press, 2017

REFERENCE BOOKS:

1. K G Budinski, Surface Engineering for wear resistance, Prentice Hall, New Jersey, 1998.
2. Surface Engineering, Process fundamentals and applications, Vol I and II, Lecture Notes of SERC school of Surface Engineering.
3. Howard E. Boyer (Editor), Case Hardening of Steel, ASM International, metals Park, OH 44073.

MM800OE: HIGH TEMPERATURE MATERIALS (Open Elective – III)

B.Tech. (MME) IV Year II Semester

L	T	P	C
3	0	0	3

Course Objectives:

- To learn and design material's microstructure for high temperature application.
- To learn scientific issues related to high temperature such as creep, oxidation and material degradation.

Course outcomes:

- Comprehensive, exposure and understanding of processing, characterization and properties of high temperature materials.
- Exposure to advanced high temperature materials such as super alloys, inter metallic and ceramics.

UNIT - I

Creep, creep resistant steels,

UNIT- II

Fatigue, thermal fatigue, ageing, structural changes, material damage, crack propagation, damage mechanics, life time analysis

UNIT- III

Oxidation, high temperature corrosion, erosion, Super alloys

UNIT- IV

Ceramics for high temperature applications,

UNIT- V

Intermetallics, usage of, spring steels, evaluation of property data extrapolation.

TEXT BOOKS:

1. Evans, R.W and Wilshire, B. Creep of metals and alloys, Institute of metals, 1985, London.
2. J.R. Davis, ASM Specialty Handbook: Heat- resistant materials, ASM,

REFERENCE BOOKS:

1. Materials Science and Engineering, 5th Ed. V. Raghavan, PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Elements of Materials Science, L.R. Van Vlack,
3. Science of Engineering Materials, vols. 1&2, Manas Chanda, McMillan Company of India Ltd.

MM801OE: LIGHT METALS AND ALLOYS (Open Elective – III)

B.Tech. (MME) IV Year II Semester	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives: The aim of this course is to understand the physical metallurgy, properties and applications of light metals.

Course Outcome: Upon successful completion of this course, the student will be able

- To understand the physical metallurgy of Light Alloys
- To understand the structure and mechanical properties of Light Metals and its alloys.
- To decide and select the alloys required for structural, manufacturing, aerospace and other industrial applications

UNIT - I

Aluminum alloys, Classification, Properties and physical metallurgy of Al-Cu alloys, Al-Mg alloys, Al-Zn alloys, Al-Mn alloys and Al-Si alloys. Ternary phase diagrams, Al-Cu-Mg alloys, Al-Si-Mg alloys and Al-Zn-Mg alloys

UNIT - II

Magnesium Alloys: Precipitation hardening in Magnesium Base alloys, Mg-Al-Zn alloys, Corrosion resistance of Mg-alloys

UNIT - III

Commercially Pure Titanium and its properties, applications, Interstitial solid solutions of Titanium, Strengthening mechanisms of Titanium alloys. Alpha Ti alloys, Beta Ti-alloys, Alpha plus Beta Ti alloys, Ti-6Al-4V, Ti-8Al-1Mo-1V, Ti-13V-11Cr-3Al alloys

UNIT - IV

Zinc and its alloys: Classification, properties and applications

UNIT - V

Beryllium alloys: Classification properties and applications. Zirconium alloys: Classification, properties and applications

TEXT BOOKS:

1. Heat treatment, structure and properties of Non-Ferrous Alloys- Charlie Brooks, ASM Metals Park, Ohio, USA
2. Light alloys: Metallurgy of the Light Metals-I Polmear, D St. John, JF Nie, M Qian - 2017

REFERENCE BOOKS:

1. Introduction to Physical Metallurgy – S.H. Avner
2. Engineering Physical Metallurgy – Y Lakhtin
3. ASM Metals Handbook Vol -1 & 2

MN600OE: INTRODUCTION TO MINING TECHNOLOGY (Open Elective – I)

B.Tech. Mining Engg. III Year II-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: The student is expected to learn the fundamentals of mining engineering so as to encourage multi-disciplinary research and application of other branches of engineering to mining technology

Course Outcomes: Upon completion of the course, the student shall be able to understand various stages in the life of the mine, drilling, blasting and shaft sinking**.**

UNIT-I

Introduction: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology,

UNIT-II

Stages in the life of the mine - prospecting, exploration, development, exploitation and reclamation. Access to mineral deposit- selection, location, size and shape (incline, shaft and adit), brief overview of underground and surface mining methods.

UNIT-III

Drilling: Types of drills, drilling methods, electric, pneumatic and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

UNIT-IV

Explosives: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

UNIT-V

Shaft sinking: Ordinary and special methods, problems, and precautions, shaft supports and lining.

TEXT BOOKS:

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001

REFERENCE BOOKS:

1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

MN601OE: COAL GASIFICATION, CBM & SHALE GAS (Open Elective – I)

B.Tech. Mining Engg. III Year II-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To specialize the students with additional knowledge on geological and technological factors of coal gasification industry mining methods of underground coal gasification, linkage techniques etc.

Course Outcomes: Student can get specialized in the underground coal gasification concepts, application and future scope in various geomining conditions.

UNIT - I

Underground Coal Gasification (UCG) Concept; Chemistry, conditions suitable for UCG, Principles of UCG., Merits and Demerits.

UNIT - II

UCG Process Component factors: Technology of UCG, opening up of coal seam for UCG.

UNIT - III

Mining methods of UCG: Chamber method, Stream method, Borehole procedure method, Blind bore hole method.

UNIT - IV

Non-Mining methods of UCG: Level seams, Inclined seams.

UNIT - V

Linkage Techniques: Pekcolation linkage, Electro linkage, Boring linkage, compressed-air-linkage, Hydraulic fracture linkage. Future Scope and Development: Innovations.

TEXT BOOKS:

1. Underground Coal Mining Methods – J.G. SINGH
2. Winning and Working Coal in India Vol.II- R.T. Deshmukh and D.J. Deshmukh.

REFERENCE BOOK:

1. Principles and Practices of Modern Coal Mining – R.D. SINGH

MN700OE: HEALTH & SAFETY IN MINES (Open Elective - II)

B.Tech. Mining Engg. IV Year I-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To brief mining students in health and safety engineering concepts, causes of accident, training, human behavioural approach in safety etc.

Course Outcomes: student will gain knowledge and able to understand the importance of health and safety including the role of safety risk assessment in mining industry

UNIT- I

Introduction to accidents, prevention, health and safety in industry: Terminology, reason for preventing accidents – moral and legal. Safety scenario in Indian mines, Accidents in Indian mines, Measurement of safety performance. Classification of accidents as per Mining legislation/law and general classification of accidents.

UNIT- II

Causes and preventive measures of accidents in underground and opencast mines i.e., due to fall of roof and sides, transportation of machinery, haulage and winding, drilling and blasting, movement of machinery in opencast mines and electricity etc., ; accident analysis and report, cost of accidents, statistical analysis of accidents and their importance for promotion of safety.

UNIT- III

System engineering approach to safety, techniques used in safety analysis, generic approach to loss control within mining operations. Concept of ZAP and MAP.

UNIT- IV

Risk management, Risk identification, Risk estimation and evaluation, Risk minimization techniques in mines. Risk analysis using FTA, HAZOP, ETA etc; health risk assessment and occupational diseases in mining.

UNIT- V

Development of safety consciousness, publicity and propaganda for safety; training of workmen, Human Behavioral approach in safety, safety polices and audio-visual aids, safety drives campaigns, safety audit. Safety management and organization; Internal safety organization

TEXT BOOKS:

1. occupational Safety and Health in Industries and Mines by C.P. Singh.
2. S.K. Das, Mine Safety and Legislation. Lovely Prakashan, Dhanbad, 2002.

REFERENCE BOOKS:

1. N.J. Bahr, System Safety Engineering and Risk Assessment: A Practical Approach, Taylor and Francis, NY, 1997.
2. Indian Mining Legislation – A Critical Appraisal by Rakesh & Prasad.

MN701OE: MATERIAL HANDLING IN MINES (Open Elective - II)

B.Tech. Mining Engg. IV Year I-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives:

- To introduce the basic principles in material handling and its equipment
- To study the conveyor system and its advancement

Course Outcomes: The students will get exposure towards the material handling methods and systems and its principle to convey the minerals or materials from mines, plants and workshops.

UNIT - I

Bulk Handling Systems: Basic principles in material handling exclusive to mining industry and its benefits. Classification of material handling equipment. Current state of art of bulk handling materials in mining in the world and Indian scenario; Selection of suitable types of systems for application. Stacking, blending, reclaiming and wagon loading, machinery and systems used at the stack yards; stock piles, silos, bunkers – their design, reclamation from them, various types of weigh bridges. Segregation - size wise and grade wise, Railway sidings.

UNIT - II

Short Conveyors and Haulage Systems: Roller conveyor, overhead conveyor, screw conveyor, auger conveyor, apron feeder, bucket elevators, scraper haulage, conveyors in steep gradient, Armoured face conveyor, Off-highway Trucks, haul roads, In-pit crushers and modular conveyors, electric trolley assisted haulage, shuttle cars, skip hoist, winders, LHD's, pneumatic conveying, hydraulic transport.

UNIT - III

Belt Conveyor System: Design, capacity, calculations with respect to the size, speed, troughing, power requirement, tension requirement, belt selection, factor of safety; developments in the design, of various components of belt conveyor systems such as; structures, rollers, gear boxes and motors, drums and pulleys, belting, ancillary components and safety gadgets.

UNIT - IV

New Types of Belt Conveyor Systems: Curved conveyors, cable belts, pipe conveyors, rock belts – mine-run-rock conveyor, steel belt conveyors, steel slot conveyor, chain belt conveyors, etc., and other new developments, stackers and reclaimers, High Angle Conveyors (HAC); New inventions in HAC , Mobile or fixed installations; Woven wire belts, En Masse conveyor, Vibrating conveyor, gravity bucket conveyor.

UNIT - V

Material Handling in Mines, Plants and Workshops: Mobile cranes, derrick cranes, pillar cranes, tower cranes, radial cranes, bridge cranes, fork lifters, overhead gantry material handling in workshops. Mineral handling in dimensional stone quarries, Mineral handling plants (coal, etc.) Locomotives, rail tracks, rail cars, railways wagons; Aerial ropeways, gravity ropeways; Containers and shipping; Rope haulage - different types.

TEXT BOOKS:

1. Allegri (Sr.), T.H., Material Handling – Principles and Practices, CBS Publishers and Distributors, Delhi, 1987.
2. Hustrulid, W., and Kuchta, M. Open Pit Mine Planning & Design, Vol. 1, Fundamentals, Balkema, Rotterdam, 1998.

REFERENCE BOOKS:

1. Kennedy, B.A., Surface Mining – 2nd Edition, SME, New York, 1990.
2. Deshmukh, D.J., Elements of Mining Technology, Vol.I, II and III, EMDEE Publishers, Nagpur, 1979.
3. Peng, S.S., and Chiang, H.S., Longwall Mining, John Wiley and Sons, New York, 1984.
4. Hartman, H.L., (Ed.), SME Mining Engg. Handbook Vol.I and II, Society for Mining, Metallurgy, and Exploration, Inc., Colorado, 1992.

MN800OE: SOLID FUEL TECHNOLOGY (Open Elective - III)

B.Tech. Mining Engg. IV Year II-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: Understand coal formation, properties, and their evaluation along with various issues of coal washing

Course Outcomes: Students can understand the fundamentals of Processes of formation of coal, properties and evaluation and coal preparation and washability characteristics of coal

UNIT- I

Introduction: Processes of formation of coal, Theories of origin of coal, Eras of coal formation, Indian Coalfields and its subsidiaries: Occurrence and distribution, coal bearing formations, coal type and rank variation, Characteristics of major coalfields, Coal production from different sectors.

UNIT- II

Coal petrography: Macro and micro lithotypes, Composition of macerals, application of coal petrography, Mineral matter in coal: Origin and chemical composition, Impact of mineral matter in coal process industry.

UNIT- III

Coal properties and their evaluation: proximate and ultimate analysis, calorific value, crossing and ignition point temperature, plastic properties (free swelling index, Caking index, Gray King Low Temperature Assay, Roga index, plastometry, dilatometry).

UNIT- IV

Physical properties like specific gravity, hard groove grindability index, heat of wetting, crossing point temperature of coal, Behavior of coal at elevated temperatures and products of thermal decomposition, Classification of coal - International and Indian classification, grading of Indian coals.

UNIT- V

Coal Washing: Principles, objectives, coal preparation, Washability characteristics; Selection, testing, storage and utilization of coking and non-coking coal, Use of coal by different industries.

TEXT BOOKS:

1. S. Sarkar, Fuels and Combustion, Orient Longman Private Ltd., 2nd edition, 1990.
2. O. P. Gupta, Elements of Fuels, Furnaces and Refractories, Khanna Publication, 3rd Edition, 1996.

REFERENCE BOOKS:

1. M. A. Elliot, Chemistry of Coal Utilization, Wiley, 1981.
2. D. Chandra, R. M. Singh, and M. P. Singh, Text Book of Coal, Tara Book Agency, 2000.

MN801OE: REMOTE SENSING AND GIS IN MINING (Open Elective - III)

B.Tech. Mining Engg. IV Year II-Semester

L	T	P	C
3	0	0	3

Pre-Requisites: NIL

Course Objectives: To introduce with basic concept of with remote sensing process, Geographical Information System and applications in mining, and modern trends of GIS in various natural resources and engineering applications.

Course Outcomes: In the present scenario, remote sensing and GIS application in mining plays important role. Details of the course enable the student to understand basic concept of remote sensing and its process to acquire data, digital Image processing system, and various application in mining.

UNIT- I

Remote Sensing Process: Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, Planck's Law, Stefan's law, properties of solar radiant energy, atmospheric windows.

UNIT- II

Physical Basis of Remote Sensing: Interaction in the atmosphere, nature of atmospheric inter action, atmospheric effects of visible, near infrared thermal microwave wavelengths, interaction at ground surface and, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture, interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

UNIT- III

Platform and Sensors: Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun synchronous orbits, sensors for visible near infrared wavelengths, profilers, images, scanners, radiometers, optical mechanical and pus h button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometri c characteristics of scanners, V/H ratio, comparison of satellite/ aerial platforms and sensors and remote sensing data products, land sat and TM, SPOT, IRS, ERS; applications in mining.

UNIT- IV

Visual & Digital Image Processing: Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps, Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification.

UNIT- V

Geographical Information System: Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitizers, raster and vector data, storage, hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and mining applications.

TEXT BOOKS:

1. B. Bhatta - Remote Sensing and GIS.
2. T.M. Lillensand and R.W. Keifer - Remote Sensing and Image Interpretation.

REFERENCE BOOK:

1. P.J. Curren- Principles of Remote Sensing R. C. Gonzalez, R. E. Woods, Digital Image Processing.