LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]

(W.e.f Academic Year 2023-24)

B.E. V-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks CIE	Maximum Marks SEE	Duration in Hours	
Theory Course											
1	U21CS501	PCC	Design and Analysis of Algorithms	3	1	-	4	40	60	3	4
2	U21CD501	PCC	Artificial Intelligence	3	-	-	3	40	60	3	3
3	U21CD502	PCC	Discrete Mathematics	3	-	-	3	40	60	3	3
4	-	PEC	Professional Elective-I	3	-	-	3	40	60	3	3
5	-	OEC	Open Elective-I	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CD5L1	PCC	Artificial Intelligence Lab	-	-	3	3	25	50	3	1.5
7	U21CS5L1	PCC	Design and Analysis of Algorithms Lab	-	-	3	3	25	50	3	1.5
Internship											
8	U21CD5P1	PROJ	Internship (During Summer Vacations after IV Sem)	-	-	2	2	50	0	3	1
Total				**15**	**1**	**8**	**24**	**300**	**400**	**24**	**20**

L: *Lecture (Hrs/Wk/Sem)* ***T****: Tutorial (Hrs/Wk/Sem)* ***P****: Practical* ***D****: Drawing (Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC**: Basic Science Course
ESC: Engineering Science Course Including Management Course **PCC:** Program core course **MA**: Mathematics **PH**: Physics **AM:** AI&ML **HSMC:** Humanities & Social Science **EN:** English **EC:** Electronics Communication **CM:** CSE-AIML **CD**: CSE-Data Science **PCC:** Program core course **PEC:** Professional Elective Course **OEC:** Open Elective Course **PROJ:** Project

Note:

1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. VI-Semester

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U21MB601	HSMC	Business Economics and Financial Analysis	3	-	-	3	40	60	3	3
2	U21CD601	PCC	Machine Learning	3	-	-	3	40	60	3	3
3	U21CD602	PCC	Distributed Database	3	1	-	3	40	60	3	4
4	-	PEC	Professional Elective-II	3	-	-	3	40	60	3	3
5	-	OEC	Open Elective-II	3	-	-	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CD6L1	PCC	Distributed Database Lab	-	-	3	3	25	50	3	1.5
7	U21CD6L2	PCC	Machine Learning Lab	-	-	3	3	25	50	3	1.5
Report Writing											
8	U21CS6L2	PCC	Scripting Language Lab	-	-	2	2	50	-	-	1
Seminar											
9.	U21CD6P1	PROJ	Technical Seminar	-	-	2	2	50	-	-	1
Skill Development Course											
10	U21MA6L1	BSC	Aptitude and Reasoning	-	-	2	2	25	50	3	1
Total				15	1	12	27	375	450	--	22

L: Lecture *(Hrs/Wk/Sem)* **T:** Tutorial *(Hrs/Wk/Sem)* ***P*:** Practical **D:** Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation **SEE:** Semester End Examination **BSC**: Basic Science Course **ESC**: Engineering Science Course **PCC:** Program core course **HSMC:** Humanities & Social Science Including Management Course **MA**: Mathematics **EN:** English
CM: CSE-AIML **PH:** Physics **EC:** Electronics Communication **CD** CSE-Data Science **AM:** AI&ML
PCC: Program Core Course **PEC:** Professional Elective Course **OEC:** Open Elective Course
PROJ: Project **MB:** Management Studies

Note:
1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

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SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/ Week	Maximum Marks CIE	Maximum Marks SEE	Duration in	
Theory Course											
1	U21CD504	PEC 1	Graph Theory	3	-	-	3	40	60	3	3
	U21CD505		Computer Networks	3	-	-	3	40	60	3	3
	U21CD506		Automata Theory, Languages and Computation	3	-	-	3	40	60	3	3
	U21CD507		Web Technologies	3	-	-	3	40	60	3	3
					-	-					
2	U21CD603	PEC 2	Block Chain Technology	3	-	-	3	40	60	3	3
	U21CD604		Network Security and Cryptography	3	-	-	3	40	60	3	3
	U21CD605		Statistical Simulation and data Analysis	3	-	-	3	40	60	3	3
	U21CD606		Software Engineering	3	-	-	3	40	60	3	3
					-	-					
3	U21CD703	PEC 3	Information Storage and Management	3	-	-	3	40	60	3	3
	U21CD704		Cloud Computing	3	-	-	3	40	60	3	3
	U21CD705		Business Intelligence and Analytics	3	-	-	3	40	60	3	3
	U21CD706		Software Testing Methodologies	3	-	-	3	40	60	3	3
					-	-					
4	U21CD707	PEC 4	Basics of Soft Computing Techniques	3	-	-	3	40	60	3	3
	U21CD708		Semantic Web Social Networks	3	-	-	3	40	60	3	3
	U21CD709		Web and Social Media Analytics	3	-	-	3	40	60	3	3
	U21CD710		Software Project Management	3	-	-	3	40	60	3	3
					-	-					
5	U21CD802	PEC 5	Optimization Techniques	3	-	-	3	40	60	3	3
	U21CD803		Secure Software Design	3	-	-	3	40	60	3	3
	U21CD804		Cognitive Science and Analytics	3	-	-	3	40	60	3	3
	U21CD805		Enterprise Architecture	3	-	-	3	40	60	3	3

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SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
PROFESSIONAL ELECTIVES

S. No.	PE-I	PE-II	PE-III	PE-IV	PE-V
1	Graph Theory	Block Chain Technology	Information Storage and Management	Basics of Soft Computing Techniques	Optimization Techniques
2	Computer Networks	Network Security and Cryptography	Cloud Computing	Semantic Web Social Networks	Secure Software Design
3	Automata Theory, Languages and Computation	Statistical Simulation and data analysis	Business Intelligence and Analytics	Web and Social Media Analytics	Cognitive Science and Analytics
4	Web Technologies	Software Engineering	Software Testing Methodologies	Software Project Management	Enterprise Architecture

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(w.e.f Academic Year 2023-24)
OPEN ELECTIVE COURSES OFFERED

S. No.	Course Code	Category	Course Title
1	U21EE508	OEC 1	Non-Conventional Energy Systems
	U21EE509		Energy Conservation and Management
	U21CS508		Data Base Management Systems**
	U21IT506		Data Structures**
	U21ME509		Basics of Mechanical Engineering
	U21ME510		Modern Manufacturing Processes
	U21CE510		Disaster Preparedness and Management
	U21CE511		Civil Engineering Principles and Practices
	U21EC507		Principles of Electronic Communication
	U21EC508		Semi-Conductor Devices
	U21MB502		Managerial Communication
	U21MB503		Managerial Science and Theory
	U21SH501		History of Science & Technology
	U21SH502		Economic Policies in India

S. No.	Course Code	Category	Course Title
2	U21EE608	OEC 2	Fundamental of Power Electronics
	U21EE609		Electrical Installation and Safety
	U21CS607		Java Programming**
	U21IT606		Operating Systems**
	U21ME608		Basics Of 3-D Printing
	U21ME609		Optimization Methods for Engineers
	U21CE607		Construction Materials
	U21CE608		Engineering Geology
	U21EC607		Principles of Data Communication and Network
	U21EC608		Embedded Systems
	U21MB602		Total Quality Management
	U21MB603		Innovation Management
	U21SH601		Indian Music System
	U21SH602		Introduction to Art and Aesthetics
	U21CD603		Data Ethics

*Note: **Subject is not offered to the students of cse and alliend branches.*

Course Code	Course Title						Core/Elective
U21CS501	**DESIGN AND ANALYSIS OF ALGORITHMS**						**Core**
Pre requisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Data Structures.	**3**	**1**	**-**	**-**	**40**	**60**	**04**

Course Objectives:

This course will enable students to:

1. Acquire the knowledge of Algorithm and problem-solving technique, limitations of algorithms.
2. Understand different techniques like divide and conquer, decrease, and conquer etc., to solve problems.
3. Understand the concept of transfer and conquer approaches
4. Understand different techniques like dynamic programming.
5. Illustrating the methods of backtracking and branch bound techniques to solve the problems like N-queens problem, graph coloring

Course Outcomes:

On completion of this course, the students are able to:

1. Identify asymptotic notations and basic efficiency classes.
2. Solve problems using various techniques like greedy and divide-and-conquer.
3. Use different algorithms like TSP, Floyd's etc. to solve real world problems.
4. Introduce the P and NP classes.
5. Develop solutions for n - Queens problem, Subset – Sum Problem, Assignment problem, Knapsack problem etc.

Unit - I

Introduction: What is an algorithm? Fundamentals of algorithmic problem solving, Fundamentals of the analysis of algorithm efficiency, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, The substitute method, Recursion tree method, Master method.

Unit - II

Divide and conquer: General Method, Binary Search, finding minimum and maximum Merge Sort analysis, Quick Sort analysis, Strassen's matrix multiplication.

The greedy method: The General Method, Knapsack problem, Job Sequencing with Deadlines, Minimum-Cost **Spanning Trees:** Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Paths.

Unit - III

Decrease and conquer approaches: Introduction, Insertion Sort, Depth First Search and Breadth First Search, Topological Sorting.

Transfer and conquer: Introduction, Balanced search trees, Heap and Heap sort.

Unit - IV

Dynamic programming: The General Method, multistage graph, Warshall's Algorithm, Floyd's Algorithm for The All-Pairs Shortest Paths Problem, single source shortest path, The Travelling Salesperson problem, optimal binary search,0/1 knapsack.

NP-HARD AND NP-COMPLETE PROBLEMS: Basic concepts: non-deterministic algorithms, the classes NP - Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.

Unit - V

Pattern Matching: The naïve string matching algorithm, Brute Force String Matching, KMP algorithm, Regular expressions.

Backtracking: n - Queens problem, Subset – Sum Problem, graph coloring.

Branch and bound: Assignment problem, Knapsack problem,15 puzzle problem, travelling salesman problem.

Text Books:

1. Anany Levitin: "Introduction to The Design and Analysis of Algorithms", (Chapters 1-5,7,9,11), Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: "Fundamentals of Computer Algorithms", (Chapters 1,3-8,10-12), Universities Press, Hyderabad, 2nd Edition, 2007, ISBN: 10: 8173716129.

Suggested Readings:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: "Introduction to Algorithms", PHI, London, England, 3rd Edition, 2010, ISBN: 9780262033848.

2. R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T. Tsai: "Introduction to the Design and Analysis of Algorithms A Strategic Approach", McGraw-Hill Higher Education, USA, International Edition, 2005, ISBN-13: 978-0071243469.

Course Code	Course Title						Core/Elective
U21CD501	ARTIFICIAL INTELLIGENCE						CORE
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Python Programming	3	-	-	-	40	60	3

Course Objectives

Develop ability to

1. Understand the importance of the field of AI by discussing its history and various applications.
2. Learn about one of the basic applications of A.I, search state formulations
3. Learn knowledge representation implementation.
4. Learn how to reason when an agent has only uncertain information about its task.
5. Know various supervised and unsupervised learning algorithms

Course Outcomes

At the end of the course, student would be able to

1. Illustrate basic principles of AI in solutions that require problem solving, search, inference
2. Demonstrate understanding of steps involved in building of intelligent agents, expert systems, Bayesian networks
3. Differentiate between learning paradigms to be applied for an application
4. Demonstrate Expert system its utilization
5. Illustrate AI application machine learning & its types.

UNIT-I

Introduction to Intelligence: Artificial Intelligence, Intelligent Systems, Foundations of artificial intelligence (AI). History of AI, Subareas of AI, Applications, Structure of Agents, Types of agents, AI problems, Agents and Environments.

UNIT -II

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

UNIT-III

Reasoning - Knowledge based agent, Propositional Logic, Inference, Predicate logic (first order logic), Inference, Resolution, Frames, Semantic Nets.

Uncertainty - Basic probability, Bayes rule, Naive Bayes, Belief networks, Inference in Bayesian Network

UNIT-IV

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Applications. AI Applications, Information retrieval, Information extraction.

UNIT-V

Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning, Reinforcement learning with applications, Natural Language processing, Speech recognition.

Text Books:

1. Stuart Russell and Peter Norvig-Artificial Intelligence – A Modern Approach, Third edition, Pearson Education Press.
3. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011

Suggested Readings:

1. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, 3rd edition, McGraw Hill,2008.

Course Code	Course Title						Core/Elective
U21CD502	**DISCRETE MATHEMATICS**						**Core**
Pre requisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Basic Mathamatics	**3**	**0**	**-**	**-**	**40**	**60**	**03**

Course Objectives

The course will introduce the students to

1. To Learn mathematical concepts as applied in computer science for solving logical problems.
2. To model relationships, analyses data, apply probability concepts and use functions to solve problems.
3. To develop the mathematical skills needed for advanced quantitative courses.
4. Apply Important problems design and methods of analysis
5. Synthesize efficient problems in common engineering design situations

Course Outcomes

After completing this course, the student will be able to:

1. Apply Propositional and Predicate logic for a variety of problems in various domains.
2. Understand Set Theory, Venn Diagrams, relations, functions and apply them to Real-world scenarios.
3. Model and solve the real-world problems using Generating Functions and Recurrence Relations.
4. To identify the basic properties of graphs and trees and use these concepts to model simple applications.
5. Understand General properties of Algebraic systems and study lattices as partially ordered sets and their applications.

UNIT – I

Logic – Sets and Functions – Logic, Propositional equivalences – Predicates and quantifiers – Nested Quantifiers Sets-Set Operations, Functions.

Algorithms- Integers – Matrices: Algorithms, Complexity of Algorithms. The Integers and Division, Integers and Algorithms, Applications of Number Theory, Matrices.

UNIT – II

Mathematical Reasoning, Induction, and Recursion: Proof Strategy, Sequence and Summation,

Counting – Basics, Pigeonhole principle, Permutations and combinations – Binomial Coefficients, Generalized Permutations and combinations, Generating permutations and combinations.

UNIT – III

Discrete Probability: An Introduction to Discrete Probability theory, Expected Value and Variance.

Advanced Counting Techniques: Recurrence relations – Solving Recurrence Relations, - Divide and conquer relations – and Recurrence Relations, Generating function – Inclusion – Exclusion – Applications of Inclusion – Exclusion.

UNIT – IV

Relations: Relations & their properties, n-ray relations and applications, Representing relations – Closures, equivalence relations, partial orderings.

Graphs: Introduction, Graph terminology, representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamiltonian paths, shortest path problems, Planar graphs, Graph coloring.

UNIT – V

Trees: Introduction to Trees, Application of Trees, Spanning Trees, Minimum Spanning Trees.

Boolean Algebra: Boolean function, Representing Boolean functions, Logic Gates

Text Books:

1. Kenneth H. Rosen – Discrete Mathematics and its Application – 5th Edition, McGraw Hill, 2003.
2. J. K. Sharma, Discrete Mathematics, Second Edition, Macmillan, 2005.

3. J.P. Tremblay, R. Manohar, Discrete Mathematical Structure with Application to Computer Science, McGraw Hill – 1997.

Suggested Readings:

1. Joel. Mott. Abraham Kandel, T.P. Baker, Discrete Mathematics for Computer Scientist & Mathematicians, Prentice Hail N.J., 2nd Edition, 1986.

Course Code	Course Title						Core/Elective
U21CD504	**GRAPH THEORY**						**PROFESSIONAL ELECTIVE**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Data Structures	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. To comprehend graphs as modeling and analysis tool
2. To introduce various data structures with graph theory
3. To learn a variety of different problems in graph theory
4. To understand and analyze various graphs
5. To know various supervised and unsupervised graphs.

Course Outcomes

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

1. Write mathematical definitions involving basic graphs
2. Differentiate the potential use of directed and undirected graphs
3. Develop algorithms based on diverse applications of graphs in different domains.
4. Validate and critically assess a mathematical proof related with graphs
5. Illustrate graph theorems and its types.

UNIT-I

BASICS OF GRAPHS AND TREES: Graphs – Introduction – Isomorphism – Sub Graphs– Walks, Paths, Circuits – Connectedness– Components – Euler Graphs – Hamiltonian paths and circuits – Trees – Properties of Trees– Distance and Centers in Tree – Rooted and Binary Trees.

UNIT-II

TREES, CONNECTIVITY & PLANARITY: Spanning Trees – Fundamental Circuits – Spanning Trees in a Weighted Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and Separability – Combinational and Geometric Graphs – Planer Graphs – Different Representation of a Planer Graph.

UNI T-III

COLOURING AND DIRECTED GRAPH: Chromatic Number – Chromatic Partitioning – Chromatic Polynomial – Edge Coloring & Vertex Coloring –Vizing's Theorem – Directed Graphs – Types of Directed Graphs – Digraphs and Binary Relations – Directed Paths and Connectedness – Euler Graphs.

UNIT-IV

MATCHINGS & COVERS: Matchings– Matchings& Coverings in Bipartite Graphs – Perfect Matching – Maximum Matching – Hall's Theorem & Consequences – Min – MaxTheorems – Independent Sets & Edge Covers – Cuts & Connectivity

UNIT-V

P LANAR GRAPHS: Plane & Planar graphs – Dual Graphs – Euler Formula – Kuratowski'sTheorem – The five- color theorem and four color conjecture.

Text Books:

1. Douglas B. West, *Introduction to Graph Theory*, 2nd Edition, Prentice Hall ofIndia,2015.
2. Narsingh Deo, *Graph Theory: With Application to Engineering and ComputerScience*, 2nd Edition, Prentice Hall of India, 2003.
3. F. Harry, *Graph Theory*, Narosa Publications, 2001.

Suggested Reading:

1. Rosen K.H., ―Discrete Mathematics and Its Applications, McGraw Hill, 2007.

Course Code	Course Title						Core/Elective
U21CD505	COMPUTER NETWORKS						Professional elective-I
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Operating Systems	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives:

Develop ability to

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. To familiarize with flow control and error control mechanisms in data link layer
3. To study the design issues in network layer and various routing algorithms
4. Learn sockets programming and how to implement client/server programs.
5. Understand the concepts of reliable data transfer and how TCP implements these concepts

Course Outcomes:

At the end of the course, student would be able to

1. Explain the function of each layer of OSI and trace the flow of information from one Node to another node in the network
2. Familiarize with the Transmission Media, Flow Control and Error Detection and Correction
3. Understand the principles of IP addressing and internet routing
4. Describe the working of various networked applications such as DNS, mail, file transfer and www
5. Implement client-server socket-based networked applications

UNIT-I

Introduction: Network Uses, Topologies, Transmission Modes, Network Hardware, Network Software, Reference Models: OSI, TCP/IP.

The Physical Layer: Theoretical basis for communication, Guided transmission media, Wireless transmission.

UNIT-II

The Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols – HDLC.

The Medium Access Control Sublayer: The Channel allocations problem, multiple access protocols, Ethernet, Wireless LANs.

UNIT-III

The Network Layer: Network layer design issues, routing algorithms, Congestion control algorithms.

Internetworking: Concatenated virtual circuits, Connectionless internet working, Tunneling, the network layer in the internet: IP protocol, IP addresses, OSPF, BGP, (IPv4 and IPv6).

UNIT-IV

Network Programming: Socket Interface: Sockets, Socket Address, Elementary Sockets, Advanced Sockets.

The Transport Layer: Transport service, Elements of transport protocols, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT-V

The Application Layer: Domain Name System-, Electronic Mail-Architecture and Services, World Wide Web: architectural overview, dynamic web document and http.

Text Books:

1. Andrew S. Tanenbaurn, Computer Networks, Fourth Edition, Pearson Education.
2. W. Richard stevens, Unix Network Programming‖ Prentice Hall/PearsonEducation, 2009.

Suggested Reading:

1. James F. Kurose, Keith W, Ross, Computer Networking, Atop-Down Approach Featuring the Internet, Third Edition, Pearson Education, 2005.

Course Code	Course Title				Core/Elective		
U21CD506	**AUTOMATA THEORY, LANGUAGES AND COMPUTATION**						**Professional Elective**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Discrete Mathematics	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. Develop a formal notation for strings, languages and machines.
2. Understand Regular expression and algebraic laws.
3. Design context free grammars to generate strings from a context free language and convert them into normal forms.
4. Identify the hierarchy of formal languages, grammars and machines.
5. Distinguish between computability and non-computability and Decidability and undecidability.

Course Outcomes

After learning the contents of this course, the student is able to

1. Gain Knowledge of the various abstract machine.
2. Use regular languages and regular expression for constructing different finite state machines
3. Understand and design different types of grammars.
4. Construct Pushdown Automata.
5. Constructed Turning Machine.

UNIT-I

Introduction to Finite Automata, Structural Representations, Basic Concepts of Automata Theory – Symbol, Alphabets, Strings, Languages, Kleene Closure, Positive Closure

Finite Automata without Output: Deterministic Finite Automata, Nondeterministic Finite Automata, Finite Automata with Epsilon-Transitions, Conversion of NFA to DFA.

UNIT-II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of regular sets, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Minimization of Automata- Equivalence, Myhill - Nerode Theorem

UNIT-III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Ambiguity in Grammars.

Push down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state & empty stack, Deterministic PDA Conversion of CFG to PDA, Conversion of PDA to CFG

UNIT-IV

Normal Forms for Context- Free Grammars: Grammar Simplification, Chomsky Normal form, Greibach Normal form.

Context-Free Languages: Statement of pumping lemma, Applications pumping lemma

Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's

UNIT-V

Turing Machines: Introduction, Techniques for construction of Turing machines, Modifications of TM, TM as enumerator, Restricted TM.

Undecidability: Recursive and Recursively enumerable languages, Halting problem, Rice Theorem, Post's correspondence problem, P,NP,NP-Complete, NP-Hard Problems, Chomsky's Hierarchy–Regular grammars, Unrestricted grammar, CSL

Text Books:

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman

Suggested Readings:

1. Zvi Kohavi, Switching and Finite Automata Theory, TMH, 1976
2. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
3. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
4. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.

Course Code	Course Title						Core/Elective
U21CD507	**WEB TECHNOLOGIES**						**PROFESSIONAL ELECTIVE**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
C, C++, Java	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objective

1. Learn various client-side technologies for developing web-based applications.
2. Learn the concepts of Java Script and Angular JS for adding rich GUI.
3. To understand server-side scripting with PHP language.
4. To familiarize the concepts about Node JS and Boot strap in dynamic web applications.
5. To learn how to establish database connectivity in web applications.

Course Outcomes

1. Understand the concepts of HTML and CSS.
2. Acquire the knowledge to build applications using Java script.
3. Understand and apply the concepts of PHP server side language.
4. Implement Boot strap to build interactive web mobile applications
5. Acquire the knowledge of database connectivity in web applications

UNIT-I

A Brief Introduction to Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, HTTP.

HTML5: Evolution of HTML and XHTML, Basic Syntax, Document Structure, Links, Images, Multimedia, Lists, Tables, Creating Forms, HTML Class, Id, HTML Layout, Responsive, HTML Media

UNIT-II

Cascading Style Sheet: Introduction, Syntax, Basic concepts, types, Navigation bars & Buttons, CSS Box Model, Web Forms, Vertical & Horizonal Menu, Working in header and footer

JavaScript: Introduction, JS Statements, Variables, Operators, Data types, Control statements, Arrays, Functions, JS Objects, JS Classes, JS HTML DOM

UNIT-III

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

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

UNIT-IV

BOOTSTRAP: Introduction, Grid Basic, Tables, Images, Alert, Buttons, Glyph icons, themes.

NODE JS: Introduction, HTTP Module, File system, Events, Upload File, Email, Node JS(MySQL as reference) CURD operations.

UNIT-V

J Query: Fundamental Concepts, J Query Effects, J Query HTML, J Query Traversing,

Case study1: Time Table Preparation

Case Study 2 : Creation of Static & Dynamic Website

Text Books:

1. Robert W. Sebesta: *Programming the World Wide Web*, 4thEdition, PearsonEducation,2009

2. Learning PHP, MySQL, books by ' O' riley Press.

3. Porter Scobey, Pawan Lingras: *Web Programming and Internet Technologies an E-Commerce Approach*, 2nd Edition, Jones &BartlettLearning,2009.

Suggested Readings:

1. Bryan Basham, Kathy Sierra, Bert Bates: Head first Servlets & JSP, 2nd edition, OREILLY,2008.

Course code	Course Title						Core/Elective
U21EE508	NONCONVENTIONAL ENERGY SYSTEMS						Open Elective
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
Engineering Chemistry	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. To understand the concepts and Importance of renewable energy sources such as solar energy and Solar radiation
2. To understand the concept of Solar energy Storage and applications
3. To understand the wind energy performance characteristics
4. To understand the concept of Bio-mass and Geothermal Energy applications
5. To understand the concept of energy extraction from OTEC

Course Outcomes

At the end of the course, the student will be able to

1. Acquire the knowledge of various components, principle of operation and present scenario ofdifferent conventional and non-conventional sources.
2. Able to understand the solar energy operation and its characteristics.
3. To educate the wind energy operation and its types.
4. The student will be able to cope up with upcoming technologies in the energy storage systems.
5. Illustrate the concepts of Direct Energy Conversion systems & their applications.

UNIT-I

Principles of Solar Radiation: Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, extra-terrestrial and terrestrial solar radiation, types & instruments for measuring solar radiations.

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, solar photovoltaic energy conversion.

UNIT-III

Wind Energy: Sources and potentials, Horizontal and Vertical axis windmills, Performance characteristics

UNIT-IV

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of biogas, utilization for cooking.

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

UNIT-V

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

Text Books:

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa

Suggested Readings:

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

Course code	Course title						Core/Elective
U21EE509	ENERGY CONSERVATION AND MANAGEMENT						Open Elective
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
Basic of Electrical Engineering	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. Familiarize present energy scenario, and energy auditing methods.
2. Explain components of electrical systems, lighting systems and improvements in performance.
3. Demonstrate different thermal systems, efficiency analysis, and energy conservation methods.
4. Train on energy conservation in major utilities.
5. Instruct principles of energy management and energy pricing.

Course Outcomes

At the end of the course, the student will be able to

1. Explain energy utilization and energy auditing methods.
2. Analyze electrical systems performance of electric motors and lighting systems.
3. Examine energy conservation methods in thermal systems.
4. Estimate efficiency of major utilities such as fans, pumps, compressed air systems, HVAC and D.G. Sets.
5. Elaborate principles of energy management, programs, energy demand and energy pricing.

UNIT-I

Introduction: Energy, Power, Past & Present Scenario of World, National Energy Consumption Data, Environmental Aspects Associated with Energy Utilization, Energy Auditing: Need, Types, Methodology and Barriers, Role of Energy Managers, Instruments for Energy Auditing.

UNIT-II

Electrical Systems: Components of EB Billing, HT and LT Supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors, Motor efficiency computation, Energy efficient motors, Illumination, Lux, Lumens, Types of lighting, Efficacy, LED Lighting and Scope of Economy in Illumination.

UNIT-III

Thermal Systems: Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters, Efficiency Computation and Encon Measures. Steam, Distribution & Usage, Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT-IV

Energy Conservation in Major Utilities: Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems, Cooling Towers, D.G. Sets.

UNIT-V

Energy Management: Principles of Energy Management, Energy Pricing.

Text Books:

1. Energy Manager Training Manual (4 Volumes) Available At www.energymanagertraining.com, A Website Administered By Bureau Of Energy Efficiency (BEE), A Statutory Body Under Ministry Of Power, Government Of India, 2004.

2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).

Suggested Readings:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, “Industrial Energy Management and Utilisation” Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. “Design And Management For Energy Conservation”, Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., “The Efficient Use Of Energy” Butterworths, London, 1982

Course Code	Course Title						Core/Elective
U21CS508	DATABASE MANAGEMENT SYSTEM						OEC-1
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming Of Problem Solving	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1.To Understand the role of database management system in an organization and learn the database concept
2. To Design database using data modeling and logical database design techniques.
3. To Construct database queries using relational algebra and calculus.
4. To Understand the concept of database transaction and related concurrent, recovery facilities.
5. To become familiar with database storage structures and access techniques.

Course Outcomes:

At the end of the course, the students will be able to:

1. Demonstrate the basic elements of a relational database management system.
2. Construct database queries using relational algebra and calculus .
3. Recognize and identify use of normalization in database design.
4. Understand the transaction processing system concurrency control mechanism.
5. Understand t storage of data, indexing, and hashing.

UNIT – I

Conceptual modeling Introduction

Introduction to database, Purpose of database system, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, Database Languages, Data Models, Functions of a DBMS, various Components of overall DBS architecture, various concepts of ER model**,** Basics of relational model.

SQL Query basis

SQL – Data Definition command, Data Manipulation command.

UNIT – II

The Relational Algebra

Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations

Relational Calculus: Tuple relational Calculus, Domain relational calculus.

UNIT – III

Introduction to NoSQL

Overview and History of NoSQL Database-The Definition of the four types of NoSQL Database, Difference between SQL and NoSQL.

Normalization

The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, The Process of Normalization,1NF, 2NF, 3NF, BCNF

UNIT – IV

Transaction Management

Transaction Processing: Transaction concept, transaction state,Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Check points of Deadlock handling.

UNIT – V

Data Storage

Overview of physical storage media, magnetic disks, storage access, files organization, Organization of record in file.

Indexing and Hashing

Basic concept, Types of indexing, Static hashing, Dynamic Hashing

Text Books:

1. “Database Management Systems”, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition, 2003.
2. “Database System Concepts” ,Abraham Silberschatz, Henry Korth and S. Sudarshan,Mc Graw Hill,6th Edition 2017.
3. “Fundamentals of Database Systems”,RamezElmasri, Shamkant B. Navathe,Pearson Eduation,6th Edition,2014.

Suggested Readings:

1. “Database System Implementation”,Héctor García-Molina, Jeffrey Ullman,PearsonEduation United states,1st Edition,2000.
2. "Database Systems: Design, Implementation, and Management”, Peter Rob, Thomson learning course Technology, 5th Edition.2003.

Course Code	Course Title						Core/Elective
U21IT506	DATA STRUCTURES						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. Develop skills to design and analyze simple linear and non-linear data structures, such as stacks, queues and lists and their applications.
2. Gain programming skills to implement sorting and searching algorithms
3. Strengthentheabilitytoidentifyandapplythesuitabledatastructuresforthe given real world problem.
4. Gain knowledge in practical applications of data structures
5. Understand essential for future programming and software engineering courses.

Course Outcomes

At the end of this course, the student will be able to

1. Implement various data structures using arrays, linked lists
2. Develop ADT necessary for solving problems based on Stacks and Queues
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

UNIT – I

Introduction Data Structures and Algorithms

Introduction to data structures, classification of data structures, operations on data structures; Algorithm Specification, Recursive algorithms, Data Abstraction.

Performance analysis - Time Complexity and Space Complexity, Asymptotic Notation-Big O, Omega, and Theta notations.

UNIT – II

Stacks and Queues

Stacks: Stack ADT, definition and operations, Implementations of stacks using array, applications of stacks, Arithmetic expression conversion and evaluation.

Queues: Queue ADT, definition and operations, Implementation of queues using Arrays, applications of linear queue, circular queue.

UNIT – III

Linked Lists: Introduction, Singly linked list, representation of a linked list in memory, operations on a Singly Linked List, Implementation of Singly Linked List.

Doubly Linked Lists: Operations on Doubly Linked List, Implementation of Doubly Linked List, Circular linked list, Implementation of Stack and Queue using linked list.

UNIT – IV

Searching Techniques: Linear search and Binary Search algorithms.

Sorting Techniques: Bubble Sort, Insertion sort, Selection Sort, Merge Sort, and Quick Sort. Comparison among sorting techniques.

UNIT – V

Trees: Introduction, Binary Trees, Tree Traversals, Threaded Binary Trees, Binary Search Tree, Heap Tree, AVL Tree.

Graphs: Graph Abstract Data Type, Representation of Graph, Graph Traversals -DFS and BFS, Introduction to Spanning Tree.

Text Books:

1. "Fundamentals of Data Structures in C", Ellis Horowitz, Sartaj Sahani, Susan Anderson Freed, Computer Science Press, 2004.
2. "Data Structures", S. Lipschutz, Tata McGraw Hill Education, 1st Edition, 2008.

Suggested Readings:

1. "Classic Data Structures", D. Samanta, PHI Learning, 2nd Edition, 2004.
2. "Data Structures and Algorithm Analysis In C", Mark A Weiss, Second Edition (2002), Pearson.

Course Code	Course Title						Core / Elective
U21ME509	BASICS OF MECHANICAL ENGINEERING						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The objective of the course is to:

1. Learn the fundamental concepts of energy, its sources and conversion
2. Comprehend the basic concepts of thermodynamics
3. Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration
4. Distinguish different metal joining techniques.
5. Enumerate the knowledge of working with conventional machine tools, their specifications.

Course Outcomes:

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

1. Identify different sources of energy and their conversion process.
2. Explain the working principle of steam boiler, hydraulic turbines, pumps, IC engines.
3. Recognize the use of internal combustion engine.
4. Recognize various metal joining processes and power transmission elements
5. Understand the properties of common engineering materials and their applications in engineering industry.

UNIT-I

Sources of Energy: Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion. **Basic concepts of Thermodynamics:** Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals).

UNIT-II

Steam: Formation of steam and thermodynamic properties of steam (simple numericals).

Boilers: Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).

Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming.

UNIT-III

Internal Combustion Engines Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.

UNIT-IV

Properties, Composition and Industrial Applications of engineering materials Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.

Joining Processes: Soldering, Brazing and Welding Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding

UNIT-V

Belt drives: Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.

Gear drives: Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.

Text Books:

1. "Elements of Mechanical Engineering", R.K. Rajput, Firewall Media, 2005
2. "Elements of Mechanical Engineering", Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.
3. "Elements of Mechanical Engineering", K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.

Suggested Readings:

1. "Elements of Mechanical Engineering", Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.
2. "A Text Book of Elements of Mechanical Engineering", S. Trymbaka Murthy, 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.

Course Code	Course Title						Core / Elective
U21ME510	MODERN MANUFACTURING PROCESS						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	-	-	-	40	60	3

Course Objectives:

The objective of the course is to:

1. Know the importance of classification of various Non-Traditional machining processes and their applicability to various metals, non - metals & alloys.
2. Teach the mechanics and thermal issues associated with chip formation
3. Teach the effects of tool geometry on machining force components and surface finish
4. Teach the machining surface finish and material removal rate

Course Outcomes:

After completing the course, the student will be able to:

1. Understand the basic techniques of modern manufacturing processes.
2. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for mechanical energy and spark energy-based machining processes
3. Understand the process parameters to be adopted and applicability of various materials that are suitable for chemical and electrical energy-based processes.
4. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for chemical and electro-chemical energy-based machining processes
5. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for thermal based machining processes.

Unit-I

Introduction: Need for non-traditional machining methods- Classification of modern machining processes – considerations in process selection, Materials, Applications, Ultrasonic machining – Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development.

Unit-II

Mechanical Energy Based Processes: Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining-Ultrasonic Machining (AJM, WJM, AWJM, USM). Working Principles – equipment used – Process parameters – MRR – Applications.

Unit-III

Electrical Energy Based Processes: Electric Discharge Machining (EDM) – working Principles-equipments - Process Parameters- MRR- electrodes Used – Power Circuits – Dielectric – Flushing – Applications, Wire Cut EDM- Applications.

Unit-IV

Chemical and Electro-Chemical Energy Based Processes: Chemical Machining and Electro-Chemical machining (CHM and ECM)-Etchants- maskants -techniques of applying maskants- Process Parameters – MRR-Applications- Principles of ECM equipments - MRR-Processes Parameters.

Unit-V

Thermal Energy Based Processes: Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining (EBM), Principles-Equipment- Process Parameters - Applications.

Advanced Machining Processes: Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolyte machining.

Text Books:

1. "Advanced Machining Processes", Vijay K. Jain, Allied Publishers.
2. "Modern Machining Processes", P. C. Pandey, H. S. Shan, Tata McGraw- Hill Education.
3. "Nontraditional Manufacturing Processes", Benedict. G. F, Marcel Dekker.

Suggested Readings:

1. "Advanced Methods of Machining", McGeough, Chapman and Hall, London.
2. "Unconventional Machining Processes", P. K. Mishra, Narosa.

Course Code	Course Title						Core/Elective
U21CE510	DISASTER PREPAREDNESS AND MANAGEMENT						OEC-1
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Environmental Engineering	3	-	-	-	40	60	3

Course Objectives:

1. Learn about the basic principles of disaster management and the types of disasters
2. Understand the disaster management cycle and framework.
3. Know about the disaster management systems in India and the applications of the latest technologies in disaster management
4. Understand about the different types of disasters.
5. Know about the past disasters occurred across the globe.

Course Outcomes:

After completing this course, the student will be able to

1. Apply the concepts of disaster management to evaluate a disaster situation.
2. Classify the various categories of disasters and their specific characteristics.
3. Classify the areas under disaster management.
4. Select appropriate pre-disaster, during disaster and post-disaster measures and framework.
5. Apply the geo informatics technology in disaster situation.
6. Identify the disaster management acts and frameworks specific to India relevant to a situation.

UNIT-I

Introduction: Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk and Capacity– Disaster and Development, and disaster management.

UNIT-II

Disasters: Geological Disasters (earthquakes, landslides ,tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters –Climate Change and Urban Disasters.

UNIT-III

Disaster Management Cycle and Framework: Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster–Evacuation–Disaster Communication – Search and Rescue – Emergency Operation Centre – incident Command System – Relief and Rehabilitation. Post-disaster–Damage and Needs Assessment, Restoration of Critical Infrastructure–Early Recovery–Reconstruction and Redevelopment; IDNDR.

UNIT-IV

Disaster Management in India: Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies.

UNIT-V

Applications of Science and Technology for Disaster Management: Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non-Structural Mitigation of Disasters S&T Institutions

for Disaster Management in India.

Text Books:

1. Disaster Management Global Challenges and Local Solutions" Rajib, Sand Krishna Murthy, R.R, CRC Press, 2009.
2. Earth and Atmospheric Disasters Management, Natural and Manmade. Navele, P & Raja, C.K, B. S. Publications, 2009
3. Disaster Science and Management, Bhattacharya, Tata Mc GrawhillCompany,2017

Suggested Reading:

1. Manual on natural disaster management in India, MC Gupta, NIDM, New Delhi
2. An overview on natural & man-made disasters and their reduction, RK Bhandani, CSIR, New Delhi
3. Disaster Management Act 2005, Published by Govt. of India

Course Code	Course Title						Core/Elective
U2IEC507	PRINCIPLES OF ELECTRONIC COMMUNICATIONS						Open Elective-I
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Analog and Digital Communication	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. Provide an introduction to fundamental concepts in the understanding of communications systems.
2. Provide an introduction to fundamental concepts in the understanding analog and digital communications.
3. Provide an introduction to network model and some of the network layers including physical layer, data link layer, network layer and transport layer.
4. Provide an introduction to fundamental concepts in the understanding telephone communication systems and optical communication systems.
5. Provide an introduction to the evolution of wireless systems and current wireless technologies.

Course Outcomes

1. Students will be able to understand the concepts related to signal transmission and related communication parameters.
2. Students will be able to learn various modulation and demodulation techniques in analog and digital communication systems.
3. Students will be able to understand the OS Inter work model and the working of data transmission
4. Students will be able to understand the evolution of communication technologies by learning basic concepts of traditional telephony systems and fundamental concepts related to optical communication systems.
5. Students will be able to understand the fundamental concepts of various current wireless technologies.

UNIT–I

Introduction to communication systems: Electromagnetic Frequency Spectrum, Elements of Electronic Communications System, Types of Communication Channels.

Signal Transmission Concepts: Base band transmission and Broadband transmission,

Communication Parameters: Transmitted power, Channel bandwidth and Noise, Need for Modulation.

Signal Radiation and Propagation: Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT–II

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, /Digital modulation schemes – ASK, FSK ,PSK QPSK, Digital demodulation.

UNIT–III

Data Communication and Networking: Topologies, Synchronous and asynchronous data transfer, Modes of Data Communication, OSI Model, Data Link Layer–Media Access control and Logic link control, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer–TCP,UDP.

UNIT–IV

Telecommunication Systems: Standard Telephone set, Basic Telephone call procedure, Public Telephone Network, Instruments, local loops, trunk circuits and various telephone Exchanges Optical Communications: Block diagram Optical Fiber Communication Systems, Optical Fiber – Classification and Configurations, Optical Fiber versus Metallic cable facilities, Wave length Division Multiplexing.

UNIT–V

Wireless Communications: AMPS overview, GSM architecture and channels, CDMA IS-95 forward and reverse channels.

Current Wireless Technologies: WLL, Wireless LAN, Bluetooth, PAN and ZigBee, RFID communication, Comparison between 1G,2G,2.5G.3G.4G, 5G. Cellular telephone, Cell Splitting, Sectoring, Segmentation, Roaming and Handoffs. Satellite Orbits, Satellite Classification, Spacing and frequency Allocation, Satellite systems link models.

Text Books:

1. Electronic Communication Systems, Fundamentals through advanced, Wayne Tomasi,5e, Pearson,2013.
2. Data Communications and Networking, Behrouz A. Forouzan, 5e TMH,2012.

Suggested Readings:

1. Kennady, Davis, Electronic Communications systems, 4e, McGraw Hill,1999.

Course Code	Course Title						Core/Elective
U21EC508	SEMICONDUCTOR DEVICES						Open Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Electronic Devices	3	-	-	-	40	60	3

Course Objectives

1. Study and Analyze the behavior of Semiconductor diodes in Forward and Reverse bias.
2. Develop Half wave and Full wave rectifiers with L, C Filters.
3. Explain V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations.
4. Explore V-I characteristics of FETs, MOSFETs and study IC fabrication techniques
5. Study the operation of special purpose devices

Course Outcomes

1. Interpret the characteristics and apply diode models to analyse various applications of diodes.
2. Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters Calculate ripple factor, efficiency and percentage regulation of rectifier circuits.
3. Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
4. Distinguish the working principles of BJT and FET also between FET & MOSFET.
5. To acquire knowledge on special purpose devices.

UNIT-I

Basics of Semiconductors: Energy bands in intrinsic and extrinsic Silicon. Carrier transport: diffusion current, drift current, mobility and resistivity; Hall Effect

Junction Diode: PN Junction formation, Characteristics, biasing–band diagram and current flow, Diode current equation, Break down in diodes, Diode as a circuit element.

UNIT-II

PN Diode Applications: Half wave, Full wave and Bridge rectifiers–their operation performance characteristics and analysis Filters (L, C filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters.

UNIT-III

Bipolar Junction Transistor: Transistor Junctionformation(collector-base,base-emitterJunctions),Transistor biasing –band diagram for NPN and PNP transistors, current components and current flowing BJT Ebers moll model, Modes of transistor operation, BJT V-I characteristics in CB, CE, CC configurations

UNIT-IV

Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Comparison of BJT and FET, FET as Voltage Variable Resistor.

UNIT-V

Special Purpose Devices: Zener Diode, Voltage Regulator, SCR, TRIAC, DIAC, Tunnel Diode, UJT, Varactor Diode, LED, LASERS, Photo Diode, Photo Detector

Text Books:

1. Jacob Millman, Christos Halkias, Chetan Parikh, “Integrated Electronics”,
2. 2nd Edition, McGraw Hill Publication, 2009. 2. David Bell, “Fundamentals of Electronic Devices and Circuits”, 5th Edition, Oxford University Press, 2008.

Suggested Readings:

1. S. Salivahanan , N Suresh Kumar , “Electronic Devices and Circuits “ 4th Edition McGraw Hill Publication.2017
2. Millman and Halkias, “Electronic Devices and Circuits”, 2nd Edition, McGraw Hill Publication, 2007.
3. Robert L. Boylestad, “Electronic Devices and Circuit Theory”, 10th Edition, PHI, 2009

Course Code	Course Title						Core/Elective
U21SH501	**HISTORY OF SCIENCE AND TECHNOLOGY**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

- To make students understand the nature of Science & Technology of Indian Society.
- To understand the vision of Nehru about Science Technology & it's development in 5yrs plan.
- To develop the importance & process of R & D.
- To create consciousness in the students on development of different types of Science & Technology areas.
- To comprehend the students about the link between Technology transfer & development.

Course Outcomes

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

1. Know the background of the nature of Science & Technology of Indian Society.
2. Gain the knowledge of the vision of Nehru about Science Technology & its development in 5yrs plan.
3. Analyze the importance & process of R & D.
4. To understand the development of different types of Science & Technology areas.
5. Interpret the link between Technology transfer & development

UNIT-I

Historical Perspective: The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.

UNIT-II

Policies and Plans after Independence: Nehru's vision of science for independent India, Science and technology developments in the new era science and technology developments during the Five-Year Plan Periods and science and technology policy resolutions.

UNIT-III

Research and Development (R&D) in India: Expenditure in R&D, Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self-reliance, activities of council of scientific and industrial research (CSIR).

UNIT-IV

Science and Technological Developments in Major Areas: Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology, Ocean Development – Objectives of ocean development, Biological and mineral resources, Marine research and capacity building, Defence Research – Spin-off technologies for civilian use, Biotechnology – Applications of biotechnology in medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of biosensors and animal husbandry

Energy – Research and development in conservation of energy, India's nuclear energy program, technology spin-offs.

UNIT-V

Nexus between Technology Transfer and Development: Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Text Books:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58.

2. Srinivasan, M., Management of Science and Technology (Problems & Prospects), East-West Press (P) Ltd., New Delhi.
3. Ramasamy, K.A., and Seshagiri Rao, K., (Eds), Science, Technology and education for Development, K., Nayudamma Memorial Science Foundation, Chennai – 8.

Suggested Readings:

1. Kohili, G.R., The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.
2. Government of India, Five Year Plans, Planning Commission, New Delhi.
3. Sharma K.D., and Quresh M.A., Science, Technology and Development, Sterling Publications (P) Ltd., New Delhi.

Course Code	Course Title						Elective
U21SH502	**ECONOMIC POLICIES IN INDIA**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

1. To gain the knowledge of Economic Development and Growth Policies.
2. To learn about Agriculture and Industrial Sectors of the Indian economy.
3. To understand the strategy of Regional Policies of India.
4. To create awareness about the Economic Reforms & External Sectors of WTO.
5. To acknowledge National & Foreign trade policy.

Course Outcomes

1. After completion of this course, the student will be able to:
2. Understand the Economic Growth and Development Policies of India.
3. Apply the knowledge of Agriculture and Industrial Sectors of the Indian economy.
4. Utilize the Regional Policies of India.
5. Awareness about the Economic Reforms & External Sectors.
6. Differentiate between the National & Foreign trade policy.

UNIT-I

Economic Development and Growth Policies:

Economic Development & Social Opportunity - Development, Freedom and Opportunity on education & health, the government, the state & the market; Human Development - Essential Components of Human development; Indexing Human Development in India - indicators, scaling and composition; Recasting Planning in terms of Human Development; Indian Political Economy (1980-2010) and Inclusive Growth, Poverty in India – estimates and methodological controversies; Human Poverty, entitlement, capability approach; Public Action and Social Inequality - public, its role, reach of inequalities, Social inequalities and economic reforms, basic equality and social security and Health care, local governance & social reforms.

UNIT-II

Agriculture and Industrial Sectors of the Indian economy:

Agriculture Growth and Industrial Performance in Indian - salient features of industrial and agriculture growth, links between agriculture and industry - production linkages, demand linkages, savings & investment linkages; Planning for Agriculture - 21st Century perspective, Indian agriculture - emerging perspectives and policy issues; Land System and its reforms in India - land reforms progress in post independent India Impact of Structural Reorganization, emerging perspectives & Policy Issues; Critical appraisal of Food Security Policy; Water Resource Development Strategy for Accelerating Agriculture Production in India; Terms of Trade Between Agriculture and Industry : Industrial growth in 80's - some
issues; Government Policy Towards Public Sector Since 1991; Paradigm shift in Industrial Policy; Jobless Growth in Indian manufacturing in 2000s..

UNIT-III

Indian Planning:

Objectives & strategy of Planning in India; Regional Planning Policy in India – regional imbalances in India and policy measures to remove regional imbalances, critical review of Regional Planning in India; Economic Growth and Social Attainment - the role of Development Strategy; Gender Responsive Budgeting and Gender Equity; Federal Finances-responsibilities and resources, division of functions, resource raising powers, transfer of resources through Twelfth and Thirteen finance Commission; Parallel Economy – causes and remedies, current status of the Black Money - Graying of India's Political economy

UNIT-IV

Economic Reforms & External Sector:

Growth & Macro Economic Imbalances in India-linkages between growth & fiscal & external balances, trends in fiscal & external deficits; Critical Appraisal of Economic Reforms; WTO - Uruguay Round of Final Act & its Implication for India, Impact of WTO on various aspects of Indian Economy, India's Role at Doha Ministerial Conference, Geneva Frame Work and update on Trade Negotiations; Foreign Trade Policy - Import – Export Policy in pre-reform period, New Trade Policy - The Reform Period, Foreign Trade Policy 2009-14; FDI in Multi-brand Trade & Safe Guards**.**

Text Books:

1. Bardhan, Pranab (1994): The Political Economy of Development in India; Oxford University Press, New Delhi

2. C.T. Kurian (1978): Poverty Planning and Social Transformation - An Alternative in Development Planning Allied Publishers, New Delhi

Suggested Readings:

1. V. M. Dandekar: The Indian Economy 1947-97; transforming traditional Agriculture Vol. I'
2. Bimal Jalan: Indian Economic Crisis: The Way Ahead; Oxford University Press, New Delhi 199.

Course Code	Course Title						Core/Elective
U21CD5L1	ARTIFICIAL INTELLIGENCE LAB						CORE
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Python Programming	L	T	D	P			
	-	-	-	3	25	50	1.5

Course Objectives

Develop ability to

1. Understand the importance of the field of AI by discussing its history and various applications.
2. Learn about one of the basic applications of A.I, search state formulations
3. Learn knowledge representation implementation.
4. Learn how to reason when an agent has only uncertain information about its task.
5. Know various supervised and unsupervised learning algorithms

Course Outcomes

At the end of the course, student would be able to

1. Illustrate basic principles of AI in solutions that require problem solving, search, inference
2. Demonstrate understanding of steps involved in building of intelligent agents, expert systems, Bayesian networks
3. Differentiate between learning paradigms to be applied for an application
4. Demonstrate Expert system its utilization
5. Illustrate AI application machine learning & its types.

1. Write a python program to implement Depth First Search Traversal.
2. Write a python program to implement Breadth First Search Traversal.
3. Write a python program to implement Greedy Best First Search algorithm.
4. Write a python program to implement A* Algorithm.
5. Write a Program Write simple facts for the statements and querying it.(Prolog).
6. Write a program for Family tree using Prolog.
7. Write a python program to implement List operations.
8. Nested List, Length, Concatenation, Membership, Iteration, Indexing and Slicing).
9. Write a python program to implement List methods (Add, Append, Extend & Delete).
10. Write a python program to implement Water Jug Problem.
11. Write a Program to Implement Travelling Salesman Problem using Python.
12. CASE STUDY
    a. Simple chatroom using Python
    b. Hospital Management System Project in Python

Text Books:

1. Rajjan Shinghal, Pattern Recognition, Oxford University Press, 2006.
2. Tom M. Mitchell, Machine Learning, Mc Graw Hill, 1997
3. Stephen Marsland, Machine Learning - An Algorithmic Perspective, CRC Press, 2009
4. Margaret H Dunham, Data Mining, Pearson Edition., 2003.
5. Galit Shmueli, Nitin R Patel, Peter C Bruce, Data Mining for Business Intelligence, Wiley India Edition, 2007.

Suggested Readings:

1. Stuart Russell and Peter Norvig-Artificial Intelligence – A Modern Approach, Third edition, Pearson Education Press,.
2. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011

Course Code	Course Title						Core / Elective
U21CS5L1	DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Data Structures	-	-	-	3	25	50	1.5

Course Objectives:

This course enables students to:

1. Understand problems by applying appropriate algorithms.
2. Analyze the efficiency of various algorithms.
3. Apply techniques of stacks and queues to solve problems.
4. Solve a program in many ways using different techniques.
5. Identify and evaluate complex problems using principles of mathematics and engineering science.

Course Outcomes:

On completion of this course, the students are able to:

1. Solve problems by applying appropriate algorithms.
2. Analyze the efficiency of various algorithms.
3. Apply techniques of stacks and queues to solve problems.
4. Develop a program that can be solved in many ways using different techniques.
5. Identify and evaluate complex problems using principles of mathematics and engineering science.

Design, develop and implement the specified algorithms for the following problems using C/Java/python Language

1. Write a program to sort the elements by using quick sort method.
2. Write a program to sort the elements by using merge sort method.
3. Obtain the Topological ordering of vertices in a given digraph.
4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's
5. algorithm.
6. Implement 0/1 Knapsack problem using Dynamic Programming.
7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
8. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

a. Compute the transitive closure of a given directed graph using Warshall's algorithm.

b. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

9. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

   b.Check whether a given graph is connected or not using DFS method.

10. Implement N Queen's problem using Back Tracking.

Text Books:

1. Anany Levitin: "Introduction to the Design and Analysis of Algorithms", Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: "Fundamentals of Computer Algorithms", Universities Press, Hyderabad, 2nd Edition, 2007, ISBN-10: 8173716129.

Suggested Reading:

1. http://cs.gmu.edu/~pwiegand/cs483-Spring06/lecturenotes/cs483-l1pf.pdf
2. http://www.cs.cornell.edu/~kozen/papers/daa.pdf

Course Code	Course Title						Core / Elective
U21CD5P1	INTERNSHIP						Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	-	50	-	1

Course Objectives:

The objective of the course is to:

1. Produce an accurate record of work performed during the Internship/Co-op
2. Apply engineering knowledge to a problem in industry
3. Produce a technical report
4. Discuss work in a team environment, if relevant to the project
5. Conduct herself/himself responsibly, safely, and ethically in a professional environment

Course Outcomes:

After completing the course, the student will be able to:

1. Design/develop a small and simple product in hardware or software.
2. Complete the task or realize a pre specified target, with limited scope, rather than taking up a complex task and leave it.
3. Learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to pre specified criteria.
4. Implement the selected solution and document the same.
5. Student will be able to construct the documentation.

Guidelines:

Internship is introduced as part of the curricula of encouraging students to work on problems of interest to Industries. A batch of three students will be attached to a person from the Government or Private Organisations /Computer Industry/Software Companies/R&D Organization for a period of 4 weeks. This will be during the summer vacation following the completion of the III-year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co-ordinate (person from industry). The course schedule will depend on the specific internship/training experience. The typical time per topic will vary depending on the internship

1. Overview of company/project
2. Safety training
3. Discussions with project teams
4. Background research, review of documents, white papers, and scientific papers
5. Planning, designing, and reviewing the planned work
6. Executing the plans
7. Documenting progress, experiments, and other technical documentation
8. Further team discussions to discuss results
9. Final report writing and presentation

After the completion of the project, each student will be required to:

Submit a brief technical report on the project executed and

Present the work through a seminar talk (to be organized by the Department)

Note: Students have to undergo summer internship of 4 weeks at the end of semester IV and credits will be awarded after evaluation in V semester.

Course Code	Course Title						Core/Elective
U21MB501	**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**						**Core**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

Student will be able to

1. Understand the concepts of Business and Economics
2. Comprehend the concepts of market dynamics namely elasticity of demand and pricing in different market structures.
3. Gain the knowledge on the production theories.
4. Gain the knowledge on cost analysis while dealing with the production.
5. Gain the knowledge on the concept of breakeven analysis.

Course Outcomes:

Student will be able to

1. Apply the concepts of business and economics during his/her professional and personal life.
2. Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand.
3. Recognize the Production function, features of Iso-Quants and Iso-Costs, different types of internal economies, external economies and law of returns with appropriate examples.
4. Prepare the financial statements of the firm.
5. Analyze the financial statements using ratio analysis and cash flow techniques.

UNIT – I

Introduction to Business and Economics: Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II

Demand and Supply Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT- III

Production, Cost, and Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, & Cost Volume Profit Analysis.

UNIT – IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems), Introduction to Cash Flow Analysis (simple problems).

TEXT BOOKS

1. A.R. Aryasri, “Managerial Economics and Financial Analysis”, TMH Publications, 3nd Edition, 2007.

Suggested Readings:

I. D.N. Dwivedi, “Managerial Economics”, Vikas Publication House Pvt. Ltd, 2nd Edition, 2012.
II. S.N. Maheshwari & S.K.Maheshwari, “Financial Accounting”, Vikas Publication House Pvt.Ltd, 4th Edition, 2012. R. Narayana Swamy, “Financial Accounting- A managerial Perspective”, Pearson publications, 1st Indian Reprint Edition, 2012.
III. J.V. Prabhakar Rao & P.V. Rao, “Managerial Economics & Financial Analysis”, Maruthi Publishers, 1st Revised Edition, 2011.
IV.
V. M.Kasi Reddy & Saraswathi, “Managerial Economics and Financial Analysis”, PHI Publications, New Delhi, 10th Revised Edition, 2012.
VI. Varshney & Maheswari, “Managerial Economics”, Sulthan Chand Publishers, 1st Revised Edition, 2009.

Course Code	Course Title						Core/Elective
U21CD601	**MACHINE LEARNING**						**Core**
Pre requisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Mathematics-III, DAA	**3**	**-**	**-**	**-**	**40**	**60**	**03**

Course Objectives:

1. To introduce the basic concepts of machine learning and range of problems that can be handled by machine learning
2. To introduce the concepts learning and decision tree induction
3. To learn the concepts of probabilistic inference, graphical models and evolutionary learning
4. To learn the concepts of ensemble learning, dimensionality reduction and clustering
5. To gain experience of doing independent study and research

Course Outcomes:

On completion of this course, the Student will be able to :

1. Design and implement machine learning solutions imply variant techniques,
2. Calculate Statistical measurements of the given data.
3. Analyze and identify the best algorithm matches for a given dataset.
4. Evaluate and interpret the results of the machine learning algorithms
5. Design and implement various machine learning algorithms in a range of real-world applications

Unit – I
Introduction: Learning, Types of Machine Learning.
Concept learning: Introduction, Version Spaces and the Candidate Elimination Algorithm.
Some Basic Statistics: Averages, Variance and Covariance, The Gaussian, The Bias-Variance, Bayes theorem. Bayes Optimal Classifier, Naïve Bayes Classifier.

Unit – II
Learning with Trees: Constructing Decision Trees, CART, Classification Example
Linear Discriminants: The Perceptron, Linear Separability, Linear Regression Multilayer.
Perceptron (MLP): Going Forwards, Backwards, MLP in practices, Deriving back.

Unit – III
Clustering: Introduction, Similarity and Distance Measures, Outliers, Hierarchical Methods, Partitional Algorithms, Clustering Large Databases, Clustering with Categorical Attributes, Comparison
Graphical Models: Bayesian networks, Approximate Inference, Making Bayesian Networks, Hidden Markov Models, The Forward Algorithm.

Unit – IV
Evolutionary Learning: Genetic Algorithms, Genetic Operators, Genetic Programming
Ensemble learning: Boosting, Bagging
Dimensionality Reduction: Linear Discriminant Analysis, Principal Component Analysis

Unit – V
Reinforcement Learning: Introduction, the learning ask, Q–learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

Text Books:
1. Tom M. Mitchell, Machine Learning, Mc Graw Hill, 1997.

Suggested Readings:

1. Stephen Marsland, Machine Learning - An Algorithmic Perspective, CRC Press, 2009
2. Margaret H Dunham, Data Mining, Pearson Edition., 2003.
3. Galit Shmueli, Nitin R Patel, Peter C Bruce, Data Mining for Business Intelligence, Wiley India Edition, 2007.
4. Rajjan Shinghal, Pattern Recognition, Oxford University Press, 2006.

Course Code	Course Title						Core/Elective
U21CD602	**DISTRIBUTED DATABASES**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Database Management System	**3**	1	**-**	**-**	**40**	**60**	**04**

Course Objectives

The course will introduce the students to

1. Introduce basic principles and implementation techniques of distributed database systems.
2. Equip students with principles and knowledge of parallel and object-oriented databases
3. To learn distributed DBMS architecture and design; query processing and optimization; distributedtransaction management and reliability; parallel and object database management systems.
4. To learn distributed DBMS architecture and reliability, parallel and object database management system.
5. Understand the case study on NoSQL and Hadoop

Course Outcomes

This course will help the students to

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object-oriented database system and related development.
4. To understand Web data management, Object Oriented data model
5. To understand the various No SQL database software and Hadoop.

UNIT – I

Introduction; Distributed Data Processing, what is Distributed Database System, Data Delivery Alternatives, Promises of DDBSs, Complication introduced by distribution, Design Issues, Distributed DBMS Architecture, Distributed Database Design.

UNIT – II

Query processing: Query processing problem, objectives, complexities of relational algebra operation, characterization of query processors, layers of query processing.
Query Decomposition and Data Localization: query decomposition, localization of distributed data.
Optimization of Distributed Queries: query Optimization, centralized query optimization, join ordering in distributed queries, distributed queryoptimization

UNIT – III

Transaction Management: Definition, properties, types, Architecture revisted
Distributed Concurrency control: serializability theory, taxonomy of concurrency control mechanism, locking-based concurrency control & algorithms, time – stamped & optimistic concurrency control Algorithms, deadlock Management.

UNIT – IV

Distributed DBMS Reliability: Reliability concepts and measures, failures in Distributed DBMS, local reliability protocols, distributed reliability protocols, dealing with site failures, network, architectural considerations.
NoSQL: Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Emergence of NoSQL, Key Points. Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment.

UNIT – V

Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design,

architectural issues, object management, distributed object storage, object query Processing, transaction management
Object Oriented Data Model: Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

TEXT BOOKS:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001, 4th Edition

2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

3. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

Suggested Readings:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”,Second Edition, Pearson International Edition
2. Martin Kleppmann, Distributed Database, Indian Edition 2002.

Course Code	Course Title						Core/Elective
U21CD603	**BLOCKCHAIN AND TECHNOLOGY**						**Professional Elective**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Information Security	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course objective:

To give students the understanding of emerging abstract models for Blockchain Technology and to familiarise with the functional/operational aspects of cryptocurrency eco-system.

1. To Understand the basics of blockchain and how to leverage the technology.
2. To understand the Essentials of Bitcoin.
3. To understand the Cryptography and cryptocurrency
4. To understand the Mining Bitcoin
5. To understand the Blockchain challenges.

Course Outcomes:

At the end of this course students will be able to…

1. Describe the basic concepts and technology used for blockchain.
2. Describe the primitives of the distributed computing and cryptography related to blockchain.
3. Illustrate the concepts of Bitcoin and their usage.
4. Implement Ethereum block chain contract.
5. Apply security features in blockchain technologies.

Unit-I

Introduction: Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problen Consensus algorithms and their scalability problems, Nakamoto's concept with Blockchain based cryptocurrenc Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digit cash etc.

Unit-II

Basic Distributed Computing & Crypto primitives: Atomic Broadcast, Consensus, Byzantine Models of fau tolerance, Hashfunctions, Puzzle friendly Hash, Collison resistant hash, digital signatures, public key crypto, verifiab random functions, Zero-knowledge systems

Unit-III

Bitcoin basics: Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoi consensus, Bitcoin scripting language and their use.

Unit-IV

Ethereum basics: Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages an verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Sma Contracts, Writing smart contracts using Solidity & JavaScript.

Unit-V

Privacy, Security issues in Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding base consensus algorithms to prevent these attacks

Case Studies:

Block chain in Financial Service, Supply Chain Management and Government Services

Text Books:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies – A Comprehensive Introduction", Princeton University Press.

Suggested Reading:

1. **Josh Thompson, 'Blockchain:** The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
2. **Imran Bashir, "Mastering Blockchain:** Distributed ledger technology, decentralization, and smart contracts explained", Packt Publishing.
3. **Merunas Grincalaitis, "Mastering Ethereum:** Implement Advanced Blockchain ApplicationsUsing Ethereum-supported Tools, Services, and Protocols", Packt Publishing.
4. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design AndUse Cases"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

Course Code	Course Title						Core/Elective
U21CD604	**NETWORK SECURITYAND CRYPTOGRAPHY**						**Professional Elective**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Computer Networks	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. To learn legal and technical issues in building secure information systems
2. To provide an understanding of network security
3. To expose the students to security standards and practices
4. To understand the various protocols for network security to protect against the threats in the network.
5. To learn about how to maintain the confidentiality, integrity, and availability of a data.

Course Outcomes

After completing this course, the student will be able to

1. Describe the steps in Security Systems development life cycle (SecSDLC)
2. Understand the common threats and attack to information systems
3. Understand the legal and ethical issues of information technology
4. Identify security needs using risk management and choose the appropriate risk control strategy basedon business needs
5. Use the basic knowledge of security frameworks in preparing security blue print for the organization

UNIT – I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT – IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT – V

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

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

TEXT BOOKS:

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

Suggested Reading:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
3. Introduction to Network Security: Neal Krawetz, CENGAGE Learning

Course Code	Course Title						Core/Elective
U21CD605	**STATISTICAL SIMULATION AND DATA ANALYSIS**						**Professional ELECTIVE**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Machine Learning and Python Programming	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

The course will introduce the students to

1. To learn Basics of Regression and Classification
2. Students know about single variable analysis and Multi variable analysis
3. Students know about Gradient for Data Analysis
4. To Understand about tree based methods.
5. To understand about supervised and unsupervised learning.

Course Outcomes

After successful completion of the course the students will be able to

1. Able to know about the regression.
2. Solve numerical issues based on regression with classification
3. Able to do sampling of data.
4. Able to know about Tree based methods
5. Able to know about unsupervised learning

Unit 1:

Course intro: Regression, classification, survival, unsupervised learning, empirical applications, General techniques: K-nearest neighbour, Bias-variance trade off, overfitting.

Unit 2:

Linear regression- Multiple linear regression, dummy variable, interactions, hypothesis testing. Linear models for classification- logistic regression, LDA, QDA, ROC curve.

Unit 3:

Resampling techniques: Cross validation, Bootstrap. Model selection: AIC, BIC, Regularisation (lasso +ridge), Stepwise regression.

Unit 4:

Tree-based methods: Trees, random forest, boosting.

Bayesian inference: prior, posterior, map, regularisation in Bayesian setup, intro to mcmc.

Unit 5:

Unsupervised learning: PCA, k-means clustering, hierarchical clustering, Gaussian mixture model Survival analysis: Kaplan Maier plot, Cox proportional hazard model, log rank test.

Text Book:

1."Simulation" by Sheldon M. Ross (Academic Press, Fourth Edition), 2006.Bootstrap from "An Introduction to the Bootstrap" by B. Efron and R.J. Tibshirani (Chapman and Hall), 1994, Chapters 1-6, 12, 13.
2."Markov Chain Monte Carlo in Practice" by W.R. Gilks, S. Richardson, D.J. Spiegelhalter (Chapman and Hall).

Suggested Readings:

1. Cluster Analysis from "Cluster Analysis" by B.S. Everitt, S. Landau, M. Leese, D. Stahl, (Wiley), 2011.
2. "Simulation and the Monte Carlo Method" by R.Y. Rubinston and D.P Kroese (Wiley).

Course Code	Course Title						Core/Elective
U21CD606	**SOFTWARE ENGINEERING**						**Professional ELECTIVE**
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
	3	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. To introduce the basic concepts of software development- processes from defining a product to shipping and maintaining that product.
2. To impart knowledge on various phases, methodologies and practices of software development.
3. To understand the importance of testing in software development and study various testing strategies and software quality metrics.
4. To impart knowledge on various phases, methodologies and practices of software developmen
5. To understand the importance of testing in software development, study various testing strategies along with its relationship with software quality and metrics

Course Outcomes

After completing this course, the student will be able to:

1. Acquire working knowledge of alternative approaches and techniques for each phase of software development.
2. Acquire skills necessary for independently developing a complete software project.
3. Understand the practical challenges associated with the development of a significant software system
4. Acquire skills necessary as an independent or as part of a team for architecting a complete software project by identifying solutions for recurring problems exerting knowledge on patterns.
5. Concede product quality through testing techniques employing appropriate metrics by understanding the practical challenges associated with the development of a significant software system.

UNIT-I

Introduction to Software Engineering:

A generic view of Process: Software Engineering, Process Framework, CMM Process Patterns, Process Assessment. **Process Models:** Prescriptive Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Models, Personal and Team Process Models, Process Technology, Product and Process.

An Agile view of Process: Introduction to Agility and Agile Process, Agile Process Models.

UNIT-II

Software Engineering Principles: SE Principles, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment.

System Engineering: Computer-based Systems, The System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling.

UNIT-III

Requirements Engineering: A Bridge to Design and Construction, Requirements Engineering Tasks, Initiating Requirements Engineering Process, Eliciting Requirements, Developing Use-Cases, Building the Analysis Model, Negotiating Requirements, Validating Requirements.

Building the Analysis Model: Requirements Analysis Modeling Approaches, Data Modeling Concepts, Object-Oriented Analysis, Scenario-based Modeling, Flow-oriented Modeling, Class-based Modeling, Creating a Behavioral Model.

UNIT-IV

Design Engineering: Design within the context of SE, Design Process and Design Quality, Design Concepts, The Design Model, Pattern-based Software Design.

Creating an Architectural Design: Software Architecture, Data Design, Architectural Styles and Patterns, Architectural Design, Assessing Alternative Architectural Designs, Mapping Data Flow into a Software Architecture.

Performing User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation.

UNIT-V

Software Quality Assurance: Basic Elements, Tasks, Goals and Metrics, Formal Approaches, Statistical Software Quality Assurance, Software Reliability, ISO 9000 Quality Standards, SQA Plan.

Testing Strategies: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for O-O Software, Validation Testing, System Testing, The Art of Debugging.

Testing Tactics: Software Testing Fundamentals, Black-box and White-box Testing, Basis Path Testing, Control Structure Testing, O-O Testing Methods, Testing Methods applicable on the Class Level, Inter Class Test Case Design, Testing for Specialized Environments, Architectures and Applications, Testing Patterns.

Text Books:

1. Roger S.Pressman," Software Enigneering: A Practitioner's Approach", 7th Edition, McGraw Hill, 2009.

Suggested Readings:

1. Ali Behforooz and Frederick J.Hudson, "Software Engineering Fundamentals", Oxford University Press, 1996.
2. PankajJalote, "An Integrated Approach to Software Engineering", 3rd Edition, Narosa Publishing House, 2008.

Course Code	Course Title						core/ Elective
U21CD603	**DATA ETHICS**						**Open Elective**
Prerequisite	**Contact Hours per week**				**CIE**	**SEE**	**credits**
	L	T	D	P			
Basics of Data Science	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives

1. Understand the importance of data ethics in modern society and its role in shapingcompetitive advantages for businesses.
2. Analyze the ethical challenges associated with the collection, processing, and use ofpersonal data by businesses and organizations.
3. Develop critical thinking skills to evaluate ethical implications of data collection and usagein various contexts.
4. Understand the legal frameworks and regulations related to data ethics and privacy.
5. Learn ethical decision-making frameworks to address complex data ethical issues in theworkplace and society.

Course Outcomes:

1. Students will be able to identify and evaluate ethical issues related to the collection and useof data in various contexts.
2. Students will understand the legal frameworks and regulations related to data ethics andprivacy and apply them to real-world scenarios.
3. Students will develop critical thinking and problem-solving skills to address complex dataethical issues in the workplace and society.
4. Students will be able to apply ethical decision-making frameworks to make informed andresponsible decisions regarding data ethics.
5. Students will be able to communicate effectively about data ethics to a variety ofaudiences, including businesses, policymakers, and the general public.

Unit-I

INTRODUCTION: What is data ethics, The fourth industrial revolution, Global standards for data ethics, Fairer market conditions, Privacy for the elite.

Digital hangovers, Oops, We're all public , Personal data becomescommercially valuable, Big data religion, Surveillance revelations

Unit-II

The data driven business model, Data as payment, Good data, Data at risk, Data brokers in a grey area, A need for new business models.

What customers want, General concern for digital surveillance, Who do internet users trust, Targeted ads and prices, Teens want privacy, Demand for data control, Consumers are beginning to act, Blocking cookies and using vpn, False data on the rise, Obfuscation, From lack of knowledge to resignation, Pay for privacy.

Unit-III

Data ethics facilitates trust, Digital trust, The snowden effect, The sharing economy, Trust is achieved in various ways, Made in europe, Privacy branding,

Privacy charlatans, Social privacy, Which is which?, More (perceived)security, More sharing

Unit-IV

A new market for privacy tech, User friendliness, Privacy products arenot new, Anonymity tech , Privacy is a commitment,

Privacy embedded in innovation, Surveillance capitalism, Declarations of independence, Anti-surveillance social revolutionaries, Privacy bydesign, A business philosophy

Unit-V

Investments in data ethical businesses, Investor storytime, Privacy ascsr criteria, Investors ask for privacy practices. Data on the political agenda, Data protection in europe, Eu general data protection regulation 2016, Beyond compliance, Human rights, Global guidelines for businesses, The data industry lobby

Text book:

1. Data ETHICS :The New Competitive Adcantages 1. Edition 2016 by Gry Hasselbalch &Pernille Tranberg.

Suggested Readings:

1. Ethics of Big Data: Balancing Risk and Innovation" by Kord Davis and Doug Patterson.
2. Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor" byVirginia Eubanks.

Course code	Course title						Core/Elective
U21EE608	FUNDAMENTALS OF POWER ELECTRONICS						Open Elective
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

1. Understand the performance of various power electronic devices.
2. Understand the VI characteristics of SCR and TRIAC.
3. Understand single phase-controlled rectifier circuits.
4. Understand choppers circuits
5. Understand the performance of AC voltage regulators.

Course Outcomes

At the end of the course students will be able to

1. Understand the performance of various power electronic devices.
2. Understand performance characteristics of SCR,TRIAC.
3. Understand performance of controlled rectifiers.
4. Understand the performance of chopper circuits.
5. Understand the performance of inverter, AC voltage regulators and cycloid converters.

UNIT-I

Introduction to power electronics, scope and applications, principle and operation of BJT, principle of operation of MOSFET and principle and operation of IGBT

UNIT-II

Power semiconductor switches and their V-I characteristics-diodes, SCR, TRIAC, Thyristor ratings and protection semiconductor switches applications.

UNIT-III

Principles of single-phase half-controlled converter with R, RL, and RLE load, Principles of single-phasefully-controlled converter with RL and RLE load, Single phase dual converters.

UNIT-IV

Introduction, Basic principles of step-down and step-up operation, chopper classification study of Buck, Boostand Buck-Boost regulators.

UNIT-V

Introduction, Principle of operation of inverters and its applications, principle of operation of single-phase voltage regulators and cyclo converter and its applications for R, R-L & R-L-E loads.

Text Books:

1. Power Electronics: Circuits, Devices & Applications, M.H.Rashid, Pearson Education India, 2009.
2. Power Electronics by Nihal kularanta

Suggested Readings:

1. Fundamentals of Power Electronics by S.K. Bhattacharya
2. Power Electronics: Converters, Applications and Design, N. Mohan and T. M. Undeland, John Wiley & Sons, 2007

Course code	Course title						Core/Elective
U21EE609	ELECTRICAL INSTALLATION AND SAFETY						Open Elective
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

1. Understand the safety and security measures to prevent the electrical shocks
2. Aquire the knowledge on installation of electrical plant.
3. Understand the safety measures on Residential, agriculture and commercial electrical installations
4. Understand the safety measures on hazardous zones and earthing.
5. Aquire the knowledge on fire extinguishing techniques

Course Outcomes

At the end of the course, the student will be able to

1. Explain the objectives and precautions of Electrical Safety, effects of Shocks and their Prevention.
2. Summarize the Safety aspects during Installation of Plant and Equipment.
3. Describe the electrical safety in residential, commercial and agricultural installations.
4. Describe the various Electrical Safety in Hazardous Areas, Equipment Earthing and System Neutral Earthing.
5. Understand the use of fire extinguishing techniques

UNIT-I

Introduction to Electrical Safety, Shocks and their Prevention: Objectives of safety and security measures, Hazards associated with electric current, and voltage,principles of electrical safety, approaches to prevent Accidents, scope of subjectelectrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shockand its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT-II

Safety during Installation of Plant and Equipment: Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant andequipment, safety aspects during installation, field quality and safety during erection.

UNIT-III

Electrical Safety in Residential, Commercial and Agricultural Installations: Wiring and fitting, Domestic appliances, water tap giving shock, shock from wet wall – fan firing shock, multi-storied building, Temporary installations, Agricultural pump installation, Do's and Don'tsfor safety in the use of domestic electrical appliances.

UNIT-IV

Electrical Safety in Hazardous Areas: Hazardous zones, class 0,1 and 2, spark, flashovers andcorona discharge and functional requirements, Specifications of electrical plants, equipment's for hazardous locations, Classification of equipment enclosure for various hazardous gases and vapours, classification of equipment/enclosure for hazardous locations.

UNIT-V

Fire Extinguishers: Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO2and Halogen gas schemes; foam schemes.

Suggested Reading:

"Electrical safety, fire safety Engineering and safety management", S. Rao, Prof. H.L.Saluja, , Khanna Publishers. New Delhi, 1988.(units-I to V)1.

"Energy management policy, planning and utilization", Pradeep Chaturvedi, ConceptPublishing company, New Delhi, 1997.

Course Code	Course Title						Core/Elective
U21CS607	JAVA PROGRAMMING						OEC-2
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programmin of problem solving	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, difference between applet and application programs, using class libraries
2. Illustrate inheritance concepts for reusing the program.
3. To create Java application programs using sound OOP practices such as interfaces, packages.
4. Demonstrate the user defined exceptions by exception handling keywords and use multi threading concepts to develc inter process communication.
5. Apply JDBC to provide a program level interface for communicating with database using java programming

Course Outcomes:

At the end of this course, the students will be able to:

1. Achieve proficiency in object-oriented concepts and also learns to incorporate the same into the Java programming languag
2. Create Java application programs using sound OOP practices e.g. Inheritance, proper program structuring by using package
3. Create Java application programs using sound OOP practices such as interfaces, packages.
4. Understand and Implement the concepts of Exception Handling in java.
5. Apply JDBC to provide a program level interface for communicating with database using java programming.

UNIT – I

Object-Oriented Programming

Benefits of Object Oriented Programming

Introduction to JAVA

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, overloading methods and constructors, parameter passing.

UNIT – II

Inheritance - Inheritance hierarchies, super and sub classes, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.

Polymorphism- dynamic binding, method overriding, abstract classes and methods.

UNIT – III

Interfaces Defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Packages-Defining, Creating and Accessing a Package, importing package.

UNIT – IV

Exception handling

Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally.

Multithreading

Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive() and join().

UNIT – V

Files

streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, File management using File class.

An overview of Advanced JAVA

Introduction to JDBC , Types of JDBC Drivers, connecting to a database, querying a database and processing the results,

updating data with JDBC.

Text Books:

1. "The Complete Reference Java" Herbert Scheldt, Tata McGraw Hill, 7th Edition,2006
2. Programming and Problem Solving with JAVA" James M Slack,Thomson Learning,2002

Suggested Readings:

3. "An Introduction to Object Oriented Programming with Java"C Thomas,McGraw Hill Publishing,5th Edition,2010.
4. "Thinking in Java", Bruce Eckel, Pearson Education,2006.
5. "Programming in Java", S.Malhotra and S.Choudhary, Oxford Univ. Press,2nd Edition,2018.

Course Code	Course Title						Core/Elective
U21IT606	OPERATING SYSTEMS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Operational Research	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives:

The Objective of this Course are:

1. Understand the services provided by and the design of an operating system.
2. Learn the structure and organization of the file systems.
3. Understand what a process is and how processes are synchronized and scheduled.
4. Understand different approaches to memory management.
5. Understand Virtual machine concepts, calls for managing processes, memory and the file system

Course Outcomes:

At the end of the course, the student will be able to

1. Understand the fundamental concepts and Functions of operating system.
2. Analyze various scheduling algorithms.
3. Understand deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Understand the functionality of file systems and perform administrative tasks on Linux Servers

UNIT-I

Introduction: Computer System organization & Architecture, Operating System Structure & Operations, Process, Memory and Storage Managements, Protection and Security, Distributed and Special-Purpose Systems, Computing Environments.
Process Concept: Overview, Process Scheduling, Operations on Processes, Inter process communication, Communication in Client/Server Systems, Operating System Examples.

UNIT-II

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Priority, Round Robin)
Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization.
Deadlocks: System Model, Deadlock characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-III

Memory-Management Strategies:
Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.
Virtual Memory Management: Background, Demand paging, Copy-on-write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

UNIT-IV

Storage Management: File System, File Concept, Access Methods, Directory Structure, File-System Mounting, File sharing, Protection.
Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure.

UNIT-V

Protection and Security: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of access rights,

Text Books:

1. "Operating System Principles", Abraham Silberschatz, Peter Galvin, Greg Gagne, Ninth Edition, John Wiley & Sons Publication, 2012.
2. "Modern Operation Systems", A.Tanenbaum, Third edition, Pearson Education, 2008.

Suggested Readings:

3. William Stallings - Operating Systems, Fifth Edition, Pearson Education, 2005.
4. Operating Systems: Principles and Practice, Thomas Anderson and Michael Dahlin, Recursive Books, 2014.

Course Code	Course Title						Core / Elective
U21ME608	BASICS OF 3-D PRINTING						OEC 2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The objective of the course is to:

1. Understand the fundamental concepts of 3D Printing, its advantages and limitations.
2. Know the working principle, advantages, disadvantages and applications of liquid, solid and Powder based 3 Printing Technologies.
3. Able to understand the method of manufacturing of liquid based, powder based and solid based techniques.
4. Understand the manufacturing procedure of a prototype using FDM technique.
5. Know diversified applications of 3D Printing Technologies.

Course Outcomes:

After completing the course, the student will be able to:

1. Understand the fundamental concepts of 3D Printing, its advantages and limitations.
2. Understand the working principle and process parameters of 3D printing processes
3. Understand the methodology to manufacture the products using LOM and FDM technologies and study the applications, advantages and case studies
4. Know the working principle, advantages, disadvantages and applications of liquid, solid and Powder based 3 Printing Technologies.
5. Know diversified applications of 3D Printing Technologies and explore the applications of 3D Printin processes in various fields

Unit-I

Introduction: Prototyping fundamentals: Need for time compression in product development, Historical development, Fundamentals of 3D Printing, 3D Printing Process Chain, Advantages and Limitations of 3D Printing, 3D Printing wheel, Commonly used Terms, Classification of 3D printing processes. Fundamental Automated Processes: Distinction between 3D Printing and Conventional Machining Processes.

Unit-II

Liquid-based 3D Printing Systems: Stereo Lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Polyjet: Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Unit-III

Solid-based 3D Printing System: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT-IV

Powder Based 3D Printing Systems: Working principle, Specifications, Materials used, Process, Applications, Advantages and Disadvantages, Case studies of the following 3D Printing Technologies like Selective laser sintering (SLS), Selective Laser Melting (SLM) and Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS), Electron Beam Melting (EBM).

Unit-V

Applications of 3D Printing : Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Electronic Industry, Jewellery Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules. Biopolymers, Packaging, Disaster Management, Entertainment and Sports industry.

Text Books:

1. "3D Printing and Additive Manufacturing Principles and Applications", Chee Kai Chua and Kah Fai Leong, Fifth Edition, World scientific

2. "Additive Manufacturing Technologies: 3D Printing", Rapid Prototyping, and Direct Digital Manufacturing- Ian Gibson, David W Rosen, Brent Stucker, Springer, Second Edition, 2010.

Suggested Readings:

1. "Rapid Prototyping & Engineering Applications", Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.
2. "Rapid Prototyping: Principles and Applications in Manufacturing", Rafiq Noorani, John Wiley & Sons, 2006.

Course Code	Course Title						Core / Elective
U21ME609	OPTIMIZATION METHODS FOR ENGINEERS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Mathematics-III	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives:

The objective of the course is to:

1. Understand the need and basic concepts of operations research and classify the optimization problems.
2. Study about the linear programming and non-linear programming concepts and their applications.
3. Use the stochastic models for discrete and continuous variables to control inventory and simulation o manufacturing models for the production decision making.
4. Evaluate the formulation of mathematical models for quantitative analysis of managerial problems in industry.
5. Study the concepts of Met heuristics Optimization techniques.

Course Outcomes:

After completing the course, the student will be able to:

1. Analyze any problem of optimization in an engineering system and able to formulate a mathematical model to th problem and solving it by the techniques that are presented.
2. Solve problems of L.P. by graphical and simplex methods.
3. Apply the knowledge of game theory concepts to articulate real-world competitive situations to identify strateg decisions to counter the consequences.
4. Demonstrate the various selective inventory control models to analyse and optimize inventory systems
5. Explain the theoretical workings of dynamic programming method to find shortest path for given network an understands the concepts to use the Metaheuristics Optimization techniques

Unit-I

Introduction: Definitions, Characteristics, Objective function, Classification of optimization problems, Engineering applications and limitations. Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints and Multivariable Optimization with Inequality Constraints: Kuhn–Tucker Condition.

Unit-II

Linear Programming: Definitions and Formulation of the LPP, Construction of L.P. Models, Slack and surplus variables, Standard form, Canonical form and matrix form of LP Problems. Artificial Variables, solution by the Big-M method, Duality principle, Dual problems and numerical problems.

Unit-III

Theory of Games: Introduction – Terminology, Solution of games with saddle points and without saddle points, 2×2 games, dominance principle, m X 2 & 2 X n games, Graphical method.

Inventory: Introduction**,** Single item**,** Deterministic models**,** Purchase inventory models with one price break and multiple price breaks, Stochastic models, demand may be discrete variable or continuous variable, Single period model and no setup cost.

Unit-IV

Dynamic Programming: Introduction, Terminology, Bellman‟s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem. Simulation: Introduction, Definition, types of simulation models, steps involved in the simulation process - Advantages and Disadvantages, Application of Simulation to queuing and inventory.

Unit-V

Waiting Lines: Introduction, Terminology, Single Channel, Poisson arrivals and exponential service times with infinite population and finite population models,

Metaheuristics Optimization: Concepts of Simulated Annealing, Theoretical approaches, Advantages and disadvantages, applications, Ant Colony Algorithms - Introduction, Collective behavior of social insects, Formalization and properties of ant colony optimization.

Text Books:

1. “Engineering Optimization: Theory and Practice”, Rao, S.S., John Wiley & Sons, Inc., 2009

2. "Operations Research, Pearson Education India", Taha, H.A., New Delhi, India, 2008.
3. "Operations Research", A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, 2013.

Suggested Readings:

1."Operation Research: Theory and Applications", Sharma J.K., Fifth Edition, Macmillan Publishers, New Delhi, India, 2013.
2. "Met heuristics for Hard Optimization" J. Dreo A. Petrowski, P. Siarry E. Taillard, Springer.

Course Code	Course Title						Core/ Elective
U21CE607	CONSTRUCTION MATERIALS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Building Materials and Construction Practices	3	-	-	3	40	60	3

Course Objectives:

1. Understand the classification, manufacturing and testing methods involving stones, bricks and concrete blocks in construction.
2. To study the field applications and concepts of lime, cement, aggregates and mortar lime in construction.
3. Understand the properties of the manufacturing process of concrete in construction.
4. Study the basics of timber and other materials.
5. To introduce students to various modern materials commonly used in civil engineering construction and their properties.

Course Outcomes:

1. Compare the properties of most common and advanced building materials.
2. Understand the typical and potential applications of lime, cement and aggregates
3. Know the Manufacturing Process of concrete
4. Understand the method of placing concrete elements.
5. Understand the applications of timbers and other materials
6. Understand the importance of modern material for construction.

UNIT- I

Stones – Bricks – Concrete Blocks- Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification –Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks

UNIT-II

Lime – Cement – Aggregates – Mortar Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT-III

Concrete-Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

UNIT-IV

Timber and Other Materials-Timber – Market forms – Industrial timber– Plywood – Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminum composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumen's.

UNIT-V

Modern Materials-Glass – Ceramics – Sealants for joints – Fabre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fabre textiles– Geo-membranes and Geotextiles for earth reinforcement

Text Books:

1. Building Materials, Varghese.P.C, PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Engineering Materials, Rajput. R.K., S. Chand and Company Ltd., 2008.
3. Concrete Technology, Gambhir.M.L., 3rd Edition, Tata McGraw Hill Education, 2004
4. Building Materials, Duggal.S.K., 4th Edition, New Age International, 2008.

Suggested Readings:

1. Alternative Building Materials Technology, Jagadish.K.S, New Age International, 2007.
2. Building Materials, products, properties and systems, Gambhir. M.L., & Neha Jamwal., Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.

Course Code	Course Title						Core/Elective
U21CE608	ENGINEERING GEOLOGY						OEC-2
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

1. Mineralogy, rock formation & types and geological structures.
2. Rock weathering, formation & classification of soils.
3. Geomorphology and rock mechanics.
4. Utility of rocks as a construction material with qualifying properties.
5. Geological problems associated with dams, reservoirs, tunnels and other geological hazards.

Course Outcomes

After completing this course, the student will be able to:

1. Identify various minerals, rocks and analyse geological structures.
2. Explain rock weathering, classify various soils and understand hydrogeology.
3. Classify landforms based on their geomorphology and evaluate the engineering properties of rocks
4. Examine rocks for their suitability in various construction applications.
5. Investigate and identify the geological problems in dams, reservoirs and tunnels, and explain
6. The geological causes of earthquakes, tsunamis and landslides.

UNIT-I

Mineralogy: Mineral, Origin and composition. Physical properties of minerals, susceptibility of minerals to weathering, Rock forming minerals.

Rocks: Igneous, sedimentary and metamorphic rocks Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Laterite, Sandstone Shale, Limestone Slate, Gneiss, Quartzite, Marble, Khondalite and chamockite.

Geological Structures: Folds, joints and faults: Fundamental types, mechanism origin and classification; Field identification and Engineering analysis of geological structures.

UNIT-II

Rock Weathering: Processes and end-products of weathering; susceptibility of rocks to weathering, Assessment of the degree of weathering and its classification.

Geology of Soils: Formation, geological classification, description and Engineering use of soils Types of Indian soils.

Hydrogeology: Hydrologic cycle, water table, aquifers, occurrence of ground water in various lithological formations, geological control for ground water movement, springs, ground water exploration and ground water provinces of India.

UNIT-III

Geomorphology: Evolution, characteristics features and Engineering, considerations of fluviatile, Aeolian, glacial and marine land forms.

Rock Mechanics: Engineering properties of rocks Stress-Strain behaviour of rocks. Site Investigation: Aerial Photographs, Electrical: Resistivity and Seismic refraction methods.

UNIT-IV

Rock as a Construction Material: Geological considerations for the selection of Concrete aggregate, Highway and Runway aggregates, building stones, Decorative stones, Roofing and facing stones.

Geology of Dams and Reservoirs: Types of Dams, Problems associated with Dam foundations and reservoirs, Engineering Geological investigations for demand water tightness in reservoir site, Analysis of dam failure; Engineering Geology of major Dam sites of India

UNIT-V

Tunnels: Stand-up time of different rocks, Engineering Geological investigations of tunnels in rock, problems in tunnelling.

Geological Hazards: Geological aspects of Earthquakes, Tsunamis and Landslides.

Text Books:

1. Principles of Engineering Geology & Geotechnics, Dimitri P. Krynine and William R. Judd, CBS Publishers &

Distributors, First Edition, 1998.
2. Principles of Engineering Geology, B.P. Attewel and I.W. Fanner, Chapman and Hall.

Suggested Readings:

1. Engineering Geology Case Histories, Officers of the Geological Survey of India, Miscellaneous Pub. No. 29, 1975.
2. Textbook of Engineering Geology, N. Chenna Kesavulu, Trinity Press, 2nd Edition.

Course Code	Course Title				Core / Elective		
U21EC607	PRINCIPLES OF DATA COMMUNICATION AND NETWORKS				Open Elective-2		
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	3	-	-	-	40	60	3

Course Objectives:

1. To familiarize the concepts of switched communication networks of OSI model for layered architecture and introduce TCP/IP suite of protocols.
2. To learn the concepts of functions of each layer of OSI model for layered architecture and introduce TCP/IP suite of protocols.
3. To understand performance of data link layer protocol for flow and Error control.
4. To analyze different routing protocols.
5. To familiarize various networked applications such a DNS, FTP, www architecture and network security.

Course Outcomes:

On completion of this course, students are able to:

1. Interpret the functions of layers in OSI model and various network topologies.
2. Demonstrate the network layer protocols, IP addressing and inter-networking.
3. Apply transport layer working with TCP and UDP.
4. Elaborate the application layer and its protocols.
5. Demonstrate the importance of network security principles and its applications.

UNIT-I

Introduction to Data communication: A Communication Model,Data representation and its flow, Network Types: LAN, WAN, MAN. Network Topologies: Bus, Star, Ring, Hybrid, Line configurations. Reference Models: OSI, TCP/IP. Transmission modes.

UNIT-II

Data Link Layer: Need for Data Link Control, Design issues, Framing, Error Detection and Correction, Flow control Protocols: Stop and Wait, Sliding Window, ARQ Protocols, HDLC. MAC Sub Layer: Multiple Access Protocols: ALOHA, CSMA, LAN- IEEE 802.2, 802.3, Wireless LAN- 802.11standard.

UNIT-III

Network Layer: Network layer Services, Routing algorithms: Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing, and Congestion Control Algorithms. InternetWorking: The Network Layer in Internet: IPV4, IPV6, Comparison of IPV4 and IPV6, IP Addressing

UNIT-IV

Transport Layer: Transport layer Services, Elements of Transport Layer, Checksum Congestion Control Connection management, TCP and UDP protocols, TCP congestion control, Packet format and flow & error control.

UNIT-V

Application Layer: Domain Name System, SNMP, Electronic Mail, World Wide Web, HTTP, FTP.

Network Security: Cryptography Symmetric Key and Public Key Cipher algorithms, Digital Signatures, Authentication Protocols.

Text Books:

1. "Data Communication and Networking,"Behrouz A. Forouzan, 3/e,TMH, 2008.
2. "Data and Computer Communications," William Stallings, 8/e,PHI, 2004.

Suggested Readings:

1. "Computer Networks," Andrew S Tanenbaum, 5/e, PearsonEducation, 2011.
2. "Computer Networks and Internet", Douglas E Comer, 5/e, Pearson Education Asia, 2009.
3. "Data Communications and Computer Networks", Prakash C. Gupta, 2/e, PHI learning, 2013.

Course Code	Course Title						Core/Elective
U21EC608	EMBEDDED SYSTEMS						Open elective-II
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	0	P			
Computer Organization Microprocessor	3	0	0	0	40	60	3

Course Objectives:

1. To understand the architecture of 8051 microcontrollers.
2. To understand the various applications of Embedded Systems using the concepts of Interfacing.
3. To familiarize with smart sensors and understand various sensor applications.
4. To learn the concepts of RTOS and the design process using RTOS.
5. To familiarize with the design principles of SOC.

Course Outcomes: students will be able to learn

1. Study and analysis of embedded systems.
2. Design and develop embedded systems (hardware, software and firmware)
3. Analyze, real time systems using RTOS and develop applications.
4. Apply knowledge to interface various sensors and its applications in embedded systems.
5. Elaborate the principles of SOC design.

UNIT-I

Embedded Computing Introduction: Complex Systems and Microprocessor Embedded System Design Process, Formalisms for System Design, Design Examples. Microprocessors and Microcontrollers: Microprocessors and Microcontrollers, The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input/output Ports and Circuits, External Memory.

UNIT-II

Introduction to 8051: Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. Bus protocols: I2Cbus and CAN bus.

UNIT-III

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 (Automotives Sensors)– Home Appliance Sensors–Aerospace Sensors—Sensors form Manufacturing–Sensors for environmental Monitoring

UNIT-IV

Introduction to Real-Time Operating Systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mail boxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment. Basic Design Using Real Time Operating System

UNIT-V

Introduction to the System Approach System Architecture: Components of the system, Hardware &Software, Processor Architectures, Memory and Addressing. System level inter connection, An approach for SOC Design, System Architecture and Complexity.

Text Books:

1. The8051Microcontroller and Embedded Systems using Assembly and C Muhammad Ali Mazidi Janice Gillespie Mazidi, Rolin D. McKinlay, ,Prentice Hall India,2ndEdition.
2. Sensors and Transducers, D. Patranabis, PHI Learning Private Limited.
3. ” Computers and Components" Wayne Wolf, Elsevier, Second Edition. Donald L Schilling & Charles Belove. Electronics Circuits. Discrete &integrated, McGraw Ifill Education (India) Private Limited. 2002.

Suggested Readings:

1. "The8051Microcontroller”, KennethJ.Ayala, Third Edition Thomson
2. “An Embedded Software Primer" David E. Simon, Pearson Education

Course Code	Course Title						Core/Elective
U21SH601	**INDIAN MUSIC SYSTEM [Common to all branches]**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

1. To create awareness among students about the contribution of different schools of Gharanas of Vocal Music.
2. To gain the knowledge of Ravindra Sangeet.
3. To comprehend the general idea of Karnataka Music and Hindustani Music.
4. To create consciousness in the students on Indian Music and Western Notation System.
5. To evaluate of different types of work in Music.

Course Outcomes

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

1. know the background of the different schools of Gharanas of Vocal Music.
2. Gain the knowledge of Ravindra Sangeet.
3. Analyze the general idea of Karnataka Music and Hindustani Music.
4. To acquaint the Indian Music and Western Notation System.
5. Interpret the different types of work in Music.

UNIT-I

Study of Style involved in different schools of Gharanas of Vocal Music.

UNIT-II

General knowledge of Ravindra Sangeet.

UNIT-III

General ideas of the factors differentiate Karnataka Music and Hindustani Music.

UNIT-IV

The evaluation of Indian Music and Western Notation System. Evaluation with special reference to the works of the Bharat, Matang, Narad, Sharangdev, Lochan, Ramatya, Ahobal, Bhavbhatt, Vyankatmukhi,
Pt. Bhatkhandey, Pt, Vishnu Digambar Paluskar.

Text Books:

1. Sangeet Nibandh Mala - Pt. Jagdish Narayan Pathak
2. Nibandh Sangeet Sangrah - H.C. Shrivastav
3. Kramik Pustak Malika (Part I – IV) - V.N. Bhatkhande

Suggested Readings:

1. 4. Bhartiya Kanth Sangeet Aur Vadya Sangeet - Dr. Arun Mishra
2. Rag Parichaya (Part I – IV) - H.C. Shrivastav

Course Code	Course Title						Core/Elective
U21SH602	**INTRODUCTION TO ART & AESTHETICS (Common to all branches)**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**40**	**60**	**2**

Course Objectives

1. To give an understanding on Indian and Western Aesthetics
2. To analyse various literary arts and its specifications
3. To understand various schools of literary criticism
4. To analyse the interconnectedness of Art and emotion

Course Outcomes

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

1. Get a historical understanding on Western and Indian Art & Aesthetics
2. Compare and contrast different schools of Arts
3. Understands the variety of arts in India
4. Analyse the contextual relevance of aesthetic theories

Unit I

What is Art and Aesthetics? How it has be seen, discussed, and practiced in India.

Unit II

Different Types of Arts ; Pre-historic art in India. Art of Indus valley Civilization. Early sculptural Traditions of Maurya, Sunga and Kushana periods. Gupta sculpture.

Unit III

Ajanta Murals and subsequent continuation at Bagh, Badami, Ellora and Vijayanagara. Miniature painting of Mughal, Rajasthan and pahari, Company painting and British art school. Raja Ravi Varma and Bengal School.

Unit IV

Aesthetics and Philosophical Aesthetics: Second order Aesthetics, The World of Human Experience and Art and Experience.

Text Books:

1. Anand, Mulk Raj : The Hindu View of Art
2. Croce, B. : Aesthetics
3. Coomaraswamy : The Transformation of Native in Art
4. Kramisch, Stella: The Vishnudhar mottaram

Suggested Readings:

1. Langer Suzanne: Feeling and Form
2. Rowland, Benjamin Jr.: Art in East and West
3. Herbert Read, Meaning of Art

Course Code	Course Title						Core/Elective
U21CD6L1	**DISTRIBUTED DATABASE LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DBMS	-	-	-	**3**	**25**	**50**	**1.5**

Course Objectives

The course will introduce the students to

1. Understanding the installation of Oracle Software
2. Revise basic SQL statements used in database management system.
3. Develop skills of students in procedure, function, triggers etc
4. To learn distributed DBMS architecture and design; query processing and optimization; distributedtransaction management and reliability; parallel and object database management systems.
5. Understand the case study on NoSQL and Hadoop.

Course Outcomes

This course will help the students to

1. Understand the installation procedure of Oracle software
2. Understand theoretical and practical aspects all the basic statements of distributed database systems.
3. Study and identify various programming concepts like trigger, cursor etc and develop software.
4. Understand the design aspects of object-oriented database system and related development.
5. To understand various NoSQL database software and Hadoop.

1.Oracle Software Installation

2. Revising SQL Commands
   a) DDL statements
   b) DML statements
   c) DCL statements
   d) TCL statements
1. Understanding of Database Objects: synonym, sequence, index and view.
2. Implement the concept of Control Statements

3. 5. Implement the concept of Cursor

4. Implement the concept of Function

5. Implement the concept of Procedure
6. Implement the concept of Package
7. Implement the concept of Trigger
8. Implement the concept of normalization
   a) Case study on NoSQL and Installation
   b) Case study on Hadoop and Installation

TEXT BOOKS:

1. Oracle Distributed Systems, O.Reilly
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

Suggested Readings:

1. Saeed K. Rahimi, Frank S. Haug, Distributed Database Management Systems: A Practical Approach, Wiley Publications

Course Code	Course Title						Core/Elective
U21CD6L2	**MACHINE LEARNING LAB**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Python Programming	**-**	**-**	**3**	**3**	**25**	**50**	**1.5**

Course Objectives:

1. The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.
2. The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.
3. To introduce students to the basic concepts of Data Science and techniques of Machine Learning.
4. To provide students with practical experience in developing machine learning models and algorithms.
5. To evaluate the performance of machine learning software for solving practical problems.

Course Outcomes:

After the completion of the course the student can able to:

1. The student must be able to design and implement machine learning solutions to classification, regression problems.
2. Understand complexity of Machine Learning algorithms and their limitations
3. Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own.
4. Be capable of performing experiments in Machine Learning using real-world data.
5. Able to evaluate and interpret the results of the algorithms.

LIST OF EXPERIMENTS:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Text Books:

1. Booz, Allen, Hamilton, The Field Guide to Data Science

Suggested Reading:

1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn and TensorFlow, O'Reilly Media, 2017-03-10
2. Peter Harrington, Machine Learning in Action, Manning Publications
(https://archive.ics.uci.edu/ml/datasets.html)

Course Code	Course Title						Core/Elective
U21CS6L2	SCRIPTING LANGUAGES LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	-	-	--	2	50	--	1

Course Objectives:

The objectives of this course are:

1. To develop an ability to design and implement static and dynamic website
2. Create conforming web pages
3. Use JavaScript for dynamic effects
4. Understand, analyze and create XML documents and XML Schema
5. Use appropriate client-side or Server-side applications.

Course Outcomes:

At the end of the course, the students will be able to:

1. Understand, analyze and apply the role of languages like HTML, CSS, XML, JavaScript, PHP, SERVLETS, JSP an protocols in the workings of the web and web applications
2. Design and implement dynamic websites with good aesthetic sense of designing
3. Create web pages using HTML and Cascading Styles sheets
4. Analyze a web page and identify its elements and attributes.
5. Develop JSP applications implementing Session management and Data base Connectivity

List of Experiments

1)Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE.

2) Write JavaScript to validate the following fields of the Registration page.
   1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
   2. Password (Password should not be less than 6 characters length).
   3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   4. Mobile Number (Phone number should contain 10 digits only).
   5. Last Name and Address (should not be Empty).

3) Develop and demonstrate the usage of inline, internal and external style sheet using CSS

4) Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox
   b) Input: A number n obtained using prompt Output: Factorial of n number using alert
   c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert
   d) Input: A number n obtained using prompt and add another number using confirm Output: Sum of the entire n numbers using alert.

5) Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size)

6) Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

7) Develop and demonstrate PHP Script for the following problems:

a) Write a PHP Script to find out the Sum of the Individual Digits.
b) Write a PHP Script to check whether the given number is Palindrome or not.

8) Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and return the user details by taking the user information from XML document using DOM parser or SAX parser.

9) Implement the following web applications using (a) PHP (b) JSP

A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).

Write a PHP Program to display current Date, Time and Day.

10) Implement the following web applications using (a) PHP (b) JSP

A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello , you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise it should send "Welcome to this site" message.

A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.

11) Implement the web applications with Database using (a) PHP, JSP

12) Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) JSP.

Text Books:

1. "The Complete Reference PHP‖, Tata McGraw-Hill", Steven Holzner, 1st Edition, 2007

Suggested Reading:

1. "Web Technologies‖, Oxford University Press", Uttam K Roy, 1st Edition, 2010.
2. "JavaScript: The Definitive Guide", David Flanagan O'Reilly, 6th Edition

Course Code	Course Title						Core/Elective
U21CD6P1	TECHNICAL SEMINAR						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	50	-	1

Course Objectives

This course enable students to:

1. Prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. Gain confidence in facing the placement interviews.
3. Enrich the communication skills of the student and presentations of technical topics of interest, this course are introduced.
4. Use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
5. Encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications.

Course Outcomes

At the end of this course, students will be able to**:**

1. Develop the habit of referring the journals for literature review.
2. Understand the gist of the research paper.
3. Identify the potential for further scope.
4. Present the work in an efficient manner.
5. Write the documentation in standard format.

Seminar topics may be chosen by the students with advice from the faculty members and the student shallread further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include followingaspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
2. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by theDepartment.

Guidelines for awarding marks		
S. No.	**Description**	**Max. Marks**
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

Note:

1. The seminar presentation should be a gist of at least five research papers from **Peer-reviewed** or **UGC recognised** journals.
2. **The seminar report should be in the following order:** Background of work, literature review, techniques used, prospective deliverables, discussion on results, conclusions, critical appraisal and reference.
3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.
4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

Course Code	Course Title					Core/Elective
U21MA6L1	**APTITUDE AND REASONING**					**Core**
Prerequisite	Contact Hours per Week			CIE	SEE	Credits
	L	T	D	P		
	-	**-**	**2**	**2**	**25**	**50**	**1**

Course Objectives

The objective of the course is to

1. Acquire the concepts of mathematical aptitude and reasoning.
2. Develop the innovative and creative thinking through basic mathematical concepts.
3. To understand analytical solving.
4. To understand the problem solving.
5. Improve analytical and problems solving skills.

Course Outcomes

After completing this course, the student will be able to:

1. Build proficiency in quantitative reasoning
2. Improve critical thinking skills
3. Enhance analytical skills
4. Demonstrate quantitative aptitude concepts
5. Adapt principles of quantitative aptitude to achieve qualitative results.

1) **Basic concepts**: combined mean, average principles, wrong values taken, number added or deleted, average speed.

2) **Percentages** -Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.

3) **Data Interpretation** - Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

4) Number Series, Letter Series, Series completion and correction, Coding and Decoding. Word analogy-Applied analogy, Classifications, verbal classification.

5) **Reasoning Logical Diagrams** - Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.

Reasoning Ability - Blood Relations, Seating arrangements, Directions, Decision making. Number Systems: Basic Concepts,

6) **Number Systems**: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules, Logic Equations, Remainder theorem, Unit digit calculation.

Progressions & Inequalities: Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.

7) **Profit and Loss**: Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc. Interest (Simple and Compound): Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest.

8) **Ratio and Proportion**: Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc.

9) **Speed, Time and Distance**: Basic Concepts, Single train problems, two train problems: some point same side, some point opposite sides, relative speed, different points meeting at common points, different points same side (different timings vs. same timings), ratios, number of stoppages, average speed, etc.

10) **Time and Work**: Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.

11) **Permutations and combinations**: Basic Concepts, differences between permutations and combinations, alternative arrangement, fixed positions, items drawing from a single group, items drawing from a multiple group, total ways of

arrangement with repetitions and without repetitions, handshakes or line joining between two points or number of matches, sides and diagonals, etc.

12) **Clocks and Calendars**: Basic Concepts, Angle between minute hand and hour hand, reflex angle, hours hand angle, time gap between minute hand and hour hand, relative time: coincide, opposite sides and right angle, mirror images, faulty clock (slow/fast), miscellaneous, calendar.

13) **Geometry and Mensuration**: Basic concepts, types of angles.

Plane figures: rectangles, squares, triangles, quadrilateral, areas, perimeters, etc.

Solid figures: cubes, cuboids, cylinders-area (total surface area and lateral surface area), volumes, perimeters.

Others: Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.

Text Book:

1. Modern Approach to Verbal & Non-Verbal Reasoning - Includes Latest Questions and their Solutions REVISED Edition (English, Paperback, Aggarwal R. S) Paperback – 1 January 2018

2. Quantitative Aptitude for Competitive Examinations Paperback – Big Book, 21 February 2017

Suggested Reading:

1. Aptitude and reasoning skills lab Manual, LIET, HYD.