GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY
Unit of USHODAYA EDUCATIONAL SOCIETY
An ISO 9001:2015 certified Institution: Recognized under Sec. 2(f)& 12(B) of UGC Act, 1956
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Semester-5 (Theory-5, Lab-2, SC-1, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	PCC	22A0541T	Theory of Computation	3	0	0	3
2	PCC	22A0520T	Computer Networks	3	0	0	3
3	PCC	22A0521T	Design and Analysis ofAlgorithms	3	0	0	3
4	PEC	22A0522Ta 22A0522Tb 22A0522Tc	**Professional Elective-I:** 1. Object Oriented Analysis and Design 2. Data warehousing and Mining 3. Cyber security	3	0	0	3
5	OEC	22A0430T 22A0258T 22A0149T 22A0323Ta	**Open Elective-I:** 1. Principles of Communication Systems 2. Applications of Power Electronics to power systems 3. Building Materials 4. Automobile Engineering	3	0	0	3
6	PCC(Lab)	22A0523P	Computer Networks Lab	0	0	3	1.5
7	PCC(Lab)	22A0524P	Design and Analysis of Algorithms Lab	0	0	3	1.5
8	SC	22A0525P	**Skill Advanced Course:** Full Stack Development	1	0	2	2
9	MC	22A0526	**Mandatory Course:** Design Thinking and Innovation	2	0	0	0
Summer Internship 2 Months (Mandatory) after second year(to be evaluated during V semester)				0	0	0	1.5
				Total credits			**21.5**

Category	**Credits**
Professional Core Courses (PCC)	12
Professional Elective Courses (PEC)	3
Open Elective Courses (OEC)	3
Skill Advanced Course (SC)	2
Summer Internship	1.5
Total	21.5

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THEORY OF COMPUTATION
(Common **to CSE, AI&ML, CS, DS**)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0541T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- Understand formal definitions of machine models
- To illustrate finite state machines to solve problems in computing
- Understanding of formal grammars
- To explain the hierarchy of problems arising in the computer sciences.
- Understanding of undecidable problems

Course Outcomes(CO):

On completion of this course, student will be able to:

- Understand the fundamental concepts of Formal Languages and Automata
- Apply the knowledge of Automata Theory, Grammars & Regular Expressions for solving various problems.
- Design of Context Free Grammar for formal language
- Construct push down automaton for the given language
- Make use of Turing machine concept to solve the simple problems
- Explain decidability or undecidability of various problems

Syllabus		Total Hours:48
Module-I	**Finite Automata**	**10Hrs**

Why Study Automata Theory? The Central Concepts of Automata Theory, Automation, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automaton, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Є-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

Module-II	**Regular Expressions**	**9Hrs**

Regular Expressions, Equivalence of two Regular Expressions, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between Finite Automata and Regular Expressions, Pumping Lemma, Closers Properties, Applications of Regular Expressions, Grammars, Classification of Grammars-Chomsky Hierarchy, Finite Automata and Regular Grammars, Regular Expressions and Regular Grammars.

Module-III	**Context Free Grammars**	**10Hrs**

ContextFree Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, E-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

Module-IV	Pushdown Automata	9Hrs
Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.		
Module-V	**Turing Machine**	**10Hrs**
Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Design of Turing Machines, Types of Turing Machines, Church's Thesis, Universal Turing Machine, Restricted Turing Machine, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP.		

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.

Reference Books:

1. Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekaran, 3rd Edition, PHI, 2007.
2. Introduction to Automata Theory, Formal Languages and Computation, Shyamalendu Kandar, Pearson, 2013.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs83/preview
2. https://nptel.ac.in/courses/106104028

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COMPUTER NETWORKS
(Common **to CSE, AI&ML, CS, DS**)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0520T	3: 0:0:0	3	CIE:30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- Determine the basic concepts of Computer Networks.
- Determine the layered approach for design of computer networks
- Distinguish OSI and TCP/IP reference models
- Predict the network path used in Internet environment
- Use the format of headers of IP, TCP and UDP
- Illustrate the concepts of application layer, network security fundamentals.

Course Outcomes(CO):

On completion of this course, student will be able to:

- Use the software and hardware components of a computer network
- Apply the reference model of a computer network
- Solve the error correction and detection in existing protocols
- Predict path for routing, and congestion control algorithms
- Determine the functionality of TCP and UDP
- Use the appropriate application layer applications

Syllabus		Total Hours:48
Module-I	**The Internet , Reference Models and Physical Layer**	**10Hrs**

Introduction: Computer Network, Network Topologies, types of networks, Reference models- The OSI Reference Model the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer –Introduction to physical layer, Guided Media- Twisted-pair cable, Coaxial cable, Fiber optic cable, Unguided media: Wireless-Radio waves, microwaves, infrared..

Module-II	The Data Link Layer	9Hrs

The Data Link Layer :Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols

Module-III	The Network Layer	10Hrs

The Network Layer: Network Layer design issues, Routing algorithms, Congestion control and Internetworking, Network layer in internet.

Module-IV	Transport Layer	9Hrs

Transport Layer: Transport layer services, service primitives, Elements of transport protocols**,** The Internet Transport Protocols: TCP/IP, UDP.

Module-V	The Application Layer and Network security	10Hrs

The Application Layer : DNS, SMTP, FTP, Email and security, network security.

Text Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.
3. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Web References:

1. https://archive.nptel.ac.in/courses/106/105/106105183/
2. https://www.coursera.org/learn/illinois-tech-computer-networking

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DESIGN AND ANALYSIS OFALGORITHMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0521T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students :

- To demonstrate the importance of algorithms in computing.
- To explain the analysis of algorithms
- To illustrate the method of finding the complexity of algorithms
- To explain the advanced algorithm design and analysis techniques.
- To introduce special classes of algorithms NP – completeness and the classes P and NP

Course Outcomes(CO):

On completion of this course, student will be able to

- To interpret the basic concepts of algorithms, Time complexity, Space complexity, Divide and conquer method, Greedy method, dynamic programming, Back tracking, Branch and Bound, NP-Hard and NP-Complete problems
- To apply Divide and Conquer method and Greedy Method to different problems and compute their time complexity
- To apply Dynamic Programming method to different problems
- To apply Backtracking method to different real-world problems
- To apply branch and bound to different problems
- To apply NP-hard and Np-Complete concepts for different problems

Syllabus		Total Hours:48
Module-I	**Introduction to Algorithm & Asymptotic Notations**	**10Hrs**

Introduction: What is an Algorithm? , Algorithm Specification , Performance Analysis: Space complexity, Time complexity.

Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples.

Module-II	Divide and conquer & Greedy Method	9Hrs

Divide and conquer: General method, Applications-Finding Maximum and minimum, Selection, binary search, quick sort, Strassen's matrix multiplication.

Greedy Method: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum cost spanning trees, Single source shortest path problem.

Module-III	Dynamic Programming	10Hrs

Dynamic Programming: General method, The Principle of Optimality, Applications- 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Optimal Binary Search Tree, Reliability design, Matrix chain multiplication.

Module-IV	Backtracking and Branch & Bound	9Hrs

Backtracking: General method, N-Queens problem, Sum of subsets problem , Graph coloring , Hamiltonian cycles.

Branch and Bound: General method, applications - travelling sales person problem, 0/1 knapsack problem- LC branch and bound solution, FIFO branch and bound solution.

Module-V	NP-Complete and NP-Hard problems	10Hrs

NP-Complete and NP-Hard problems:
Basic concepts: deterministic and non deterministic algorithms, Tractable and Intractable Problems , Complexity Classes: P, NP, NP-Hard and NP-Complete

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd.

Reference Books:

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).
3. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
4. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
5. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://nptel.ac.in/courses/106106131

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OBJECT ORIENTED ANALYSIS AND DESIGN
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0522Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- Understand the concepts of object oriented system
- Unified approach,& Understand object oriented system development methodologies. & Demonstrate UML diagrams
- Model user interface and map object oriented system to relational system

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the concepts of object model.
- Identify the classes and vocabulary of the problem domain.
- Illustrate the importance of modeling and software development life cycle.
- Draw the class and object diagrams for various applications.
- Apply the basics of behavioral modeling to behavioral diagrams.
- Model the various components and deployment diagram for the applications.

Syllabus		Total Hours:48
Module-I	**Introduction to Object Model**	**9Hrs**

Introduction to Object Model: Introduction to object oriented analysis and Design, Iterative development and the Unified Process (UP), UP phases: Inception, Elaboration, Construction and Transition, Object-oriented metrics, the Evolution of Object Model, Foundation of Object Model, Elements of object Model, Applying object Model. .(Text Book 1)

Module-II	**Classes and Objects**	**10Hrs**

Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms.(Text Book 1)

Module-III	**Introduction to UML**	**9Hrs**

Introduction to UML: The importance of modeling, Principles of modeling, Object oriented modeling, why model, Conceptual model of UML, Architecture, Software Development Life Cycle. (Text Book 2)

Module-IV	**Structural Modeling**	**10Hrs**

Basic Structural Modelling: Classes, Relationships, Common Mechanisms, and diagrams, class diagrams.

Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Object Diagrams. (Text Book 2)

Module-V	**Behavioral Modeling**	**10Hrs**

Basic Behavioral Modeling: Interactions, Interaction diagrams, use cases, Use case diagrams, Activity Diagrams, Sequence Diagrams, Collaboration and Deployment diagrams.

Advanced Behavioral Modeling: Events and signals, state machines, time and space, state chart diagrams. (Text Book 2)

Text Books:

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, PEARSON, 3rd edition, 2013.
2. The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12th Impression, 2012

Reference Books:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs48/preview

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DATA WAREHOUSING & MINING					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0522Tb	**3:0:0:0**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**PCC**

Course Objectives:

This course will enable students to:

- To know the basic concepts and principles of Data Warehouse.
- Study the Data Mining and Major Issues in Data Mining.
- Learn pre-processing techniques and Data Transformation.
- Study the performance of Frequent Item sets and Classification.
- Understand and compare different types of Cluster Analysis.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the basic concepts of data warehouse and data mining.
- Determine the Data Warehouse Design and Data Warehouse Schemas.
- Use the Data Mining Technologies and Major Issues in Data Mining
- Apply pre-processing techniques for data cleaning.
- Apply the Frequent Patterns and Classification Methods for item sets.
- Determine the performance of the different Cluster algorithms.

Syllabus		**Total Hours:48**
Module-I	**Data Warehousing and Online Analytical Processing**	**10 Hrs**
Data Warehouse: Basic Concepts, Data Warehouse Modeling: Data Cube and OLAP, Data Warehouse Design and Usage, Data Warehouse Schemas for Decision Support, Data Warehouse Implementation.		
Module-II	**Introduction to Data Mining**	**10 Hrs**
Why Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Which Technologies Are Used, Major Issues in Data Mining.		
Module-III	**Data Preprocessing**	**9 Hrs**
Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.		
Module-IV	**Mining Frequent Patterns, Association rule mining and Classification**	**10 Hrs**
Basic Concepts, Frequent Item set Mining Methods, Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Support vector machine.		
Module-V	**Cluster Analysis**	**9 Hrs**
Cluster Analysis: Partitioning Methods, Hierarchical Methods, Density-Based Methods, outlier analysis and detection methods.		

Text Books:

1. Data Mining: concepts and techniques / Jiawei Han, Micheline Kamber, Jian Pei. – 3rd ed.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory & Dennis Murray Pearson EdnAsia.
3. Insight into Data Mining, K. P. Soman, S. Diwakar, V. Ajay, PHI,2008.
4. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_cs06/preview

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CYBER SECURITY
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0522Tc	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.
- Evaluate the trends and patterns that will determine the future state of cyber security.

Course Outcomes(CO):

On completion of this course, student will be able to

- Cyber Security architecture principles
- Identifying System and application security threats and vulnerabilities
- Identifying different classes of attacks
- Identify cybercrimes in wireless devices and Mobiles
- Cyber Security incidents to apply appropriate response
- Describing risk management processes and practices

Syllabus		Total Hours:48
Module-I	**Introduction to Cybercrime**	**9 Hrs**

Introduction to Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Module-II	Cyber Offenses	10 Hrs

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Backdoors-Steganography-SQL Injection.

Module-III	Cybercrime Mobile and Wireless Devices	9 Hrs

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

Module-IV	Tools and Methods Used in Cybercrime	10Hrs

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

Module-V	Cyber Crimes and security	10Hrs
Cyber Security –Organizational implications-cost of cybercrimes and IPR issues Web threats for organizations: the evils and Perils-Social media marketing Security and privacy Implications-Protecting people privacy in the organizations Forensic best practices for organizations. Cases.		

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.

Reference Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Principles of Information Security, Micheal E.Whitman and Herbert J.Mattord, Cengage Learning

Web References:

1. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs127/preview

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PRINCIPLES OF COMMUNICATION SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0430T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students to:

- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Course Outcomes(CO):

On completion of this course, student will be able to

- Understand the concept of various modulation schemes.
- Understand the concept of Different multiplexing techniques.
- Apply the concept of various modulation schemes to solve engineering problems.
- Analyse various modulation schemes.
- Evaluate various modulation schemes in real time applications.
- Understand the concept of various Communication systems.

Syllabus		Total Hours:48
Module-I	**Amplitude Modulation**	**10Hrs**

Amplitude Modulation: Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation
Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB, Radio Transmitter and Receiver. Theta notation (Θ), Mathematical analysis of Non-Recursive and recursive Algorithms with Examples.

Module-II	Frequency Modulation	9Hrs

Frequency Modulation: Introduction to Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting..

Module-III	Pulse Modulation	10Hrs

Pulse Modulation: Sampling Theorem- Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing and Frequency Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals

Module-IV	Digital Modulation	9Hrs

Digital Modulation: Binary Amplitude Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater, M-ary and comparison

Module-V	NP-Complete and NP-Hard problems	10Hrs

Communication Systems: Satellite, RADAR, Optical, Micro wave communication, Mobile and Computer Communication (Block diagram approach only).

Text Books:

1. Herbert Taub, Donald L Schilling and Goutam Saha, “Principles of Communication Systems”, 3 rd Edition, Tata McGraw-Hill Publishing Company Ltd., 2008.

Reference Books:

1. B. P. Lathi, Zhi Ding and Hari M. Gupta, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.
2. K. Sam Shanmugam “Digital and Analog Communication Systems”, Wiley India Edition, 2008.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ee05/preview
2. https://archive.nptel.ac.in/courses/108/104/108104091/

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APPLICATIONS OF POWER ELECTRONICS TO POWER SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0258T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

Student will be able to,

- To develop the understanding of uncompensated lines and their behavior under heavy loading conditions.
- To understand the concept and importance controllable parameters of FACTS controllers.
- To emphasize the objectives of Shunt compensation, and basic operation of SVC and STATCOM.

Course Outcomes(CO):

On completion of this course, student will be able to

- Choose proper controller for the specific application based on system requirements
- Understand various systems thoroughly and their requirements
- Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping

Syllabus		Total Hours:48
Module-I	**General System considerations and FACTS**	**10Hrs**

Transmission Interconnections, Flow of Power in an AC System, Power Flow and Dynamic Stability Considerations of a Transmission Interconnection, principles of series and shunt compensation, Basic Types of FACTS Controllers, Benefits from FACTS, Application of FACTS.

Module-II	Shunt Compensators	08Hrs

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, improvement of Transient Stability, Power Oscillation Damping, Static Var Compensators, SVC and STATCOM, The Regulation Slope, Transfer Function and dynamic Performance, Transient Stability, Enhancement and Power Oscillation Damping.

Module-III	Series Compensators	10Hrs

Objectives of Series Compensation, concept of series capacitive compensation, voltage stability, improvement of transient stability, power oscillation damping, GTO thyristor controlled series capacitor, Thyristor controlled series capacitor, SSSC.

Module-IV	Combined Compensators	10Hrs

Introduction, Unified power flow controller, basic operating principles, independent real and reactive power flow control, and control structure, basic control system for P and Q control.

Module-V	Mitigation of Harmonics	10Hrs

Power quality problems, harmonics, harmonic creating loads, harmonic power flow, and mitigation of harmonics, filters, passive filters, active filters, shunt, series and hybrid filters.

Text Books:

1. Narain G. Hingorani, Laszlo Gyugyi, Understanding FACTS, IEEE press
2. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, Electrical Power Systems Quality, McGraw Hill,2003

Reference Books:

1. Y.H.Song, A.T.Johns, Flexible A.C.Transmission System, IEE, London, 1999Edition, Pearson, 2010

Web References:

1. https://onlinecourses.nptel.ac.in/noc24_ee130/preview

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BUILDING MATERIALS

(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0149T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

To identify the traditional materials that is used for building constructions.

- To explain basic concepts of building components such as stair case and masonry
- To know the causes of dampness in structures and its preventive measures
- To understand the building rules, building bye laws and acoustics of building

Course Outcomes(CO):

On completion of this course, student will be able to

- To understand the characteristics of different building materials
- Differentiate brick masonry, stone masonry construction and bonds used in construction of walls of buildings
- To know about the causes of dampness in buildings and its ill effects
- To understand the principles of planning in buildings
- Describe capable of understanding building rules and knowledge about, bye-laws and building elements.

Syllabus		Total Hours:48
Module-I	**MATERIALS**	**9Hrs**
Traditional materials: Stones- Types of stone masonry -Brick-types of brick masonry- lime Cement – Timber – Seasoning of timber - their uses in building works		
Module-II	**BUILDING COMPONENTS**	**9Hrs**
Lintels, Arches and Vaults – Staircases, Lifts – Types. Different types of flooring-Concrete, Mosaic, Terrazo floors; Different types of roofs- Pitched, Flat and Curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs - King and Queen Post Trusses. Doors & Windows- Types and Specifications		
Module-III	**DAMPNESS**	**10Hrs**
Dampness and its prevention: Causes of dampness- ill effects of dampness-requirements of an ideal material for damp proofing-materials for damp proofing –methods of damp proofing.		
Module-IV	**BUILDING PLANNING**	**10Hrs**
Elements of building planning- basic requirements-orientation-planning for energy efficiency-planning based on utility-other requirements		
Module-V	**BUILDING RULES AND BYE-LAWS**	**10Hrs**
Zoning regulations; Regulations regarding layouts or subdivisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index. Building Information System.		

Text Books:

1. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGraw-Hill, New
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, ‚Building Construction' - Laxmi Publications (P) Ltd., New Delhi

Reference Books:

1. Building Materials, S. K. Duggal, New Age International Publications.
2. N. Kumaraswamy, A. Kameswara Rao, building planning and drawing, 7th Ed, Charotar

Web References:

1. http://nptel.ac.in/courses/105104103/
2. http://www.academicpub.org/jwrhe/
3. http://www.peo.on.ca/index.php/ci_id/21843/la_id/1

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AUTOMOBILE ENGINEERING
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0323Ta	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students :

- Impart the knowledge of vehicle structure and its components.
- Demonstrate various components of petrol engines and diesel engines.
- Trains about the various electrical system, circuits, and testing of automobiles.
- Explain the concepts of steering, suspension and braking system in automobile.

Course Outcomes(CO):

On completion of this course, student will be able to

- Identify different parts of automobile
- Explain the working of various parts like engine and brakes
- Describe the working of steering and the suspension systems.
- Summarize the wheels and tires
- Outline the future developments in the automobile industry

Syllabus		Total Hours:48
Module-I	**Introduction to vehicle structure and engine components**	**9Hrs**

Vehicle construction - Chassis and body - Specifications - Engine - Types - Construction - Location of engine - Cylinder arrangement - Construction details - Cylinder block - Cylinder head - Cylinder liners - Piston – piston rings - Piston pin - Connecting rod - Crankshaft - Valves. Lubrication system - Types - Oil pumps - Filters. Crankcase ventilation

Module-II	Ignition and fuel supply systems	10Hrs

Ignition system - Coil and Magneto - Spark plug - Distributor – Electronic ignition system - Fuel system - Carburetor - Fuel pumps - Fuel injection systems - Mono point and Multi point – Unit Injector – Nozzle types - Electronic Fuel Injection system (EFI) – GDI, MPFI, DTSI.

Module-III	Steering and suspension system	9Hrs

Principle of steering - Steering Geometry and wheel alignment - Steering linkages – Steering gearboxes - Power steering - front axle - Suspension system - Independent and Solid axle – coil, leaf spring and air suspensions - torsion bar - shock absorbers.

Module-IV	Wheels, Tyres and Braking System	10Hrs

Wheels and Tyres - Construction - Type and specification - Tyre wear and causes - Brakes - Needs – Classification –Drum and Disc Mechanical - Hydraulic and pneumatic - Vacuum assist – Retarders – Anti-lock Braking System(ABS).

Module-V	Automobile electrical systems and advances in automobile engineering	10Hrs

Battery-General electrical circuits- Active Suspension System (ASS) - Electronic Brake Distribution (EBD) – Electronic Stability Program(ESP), Traction Control System (TCS) - Global Positioning System (GPS), Hybrid vehicle, Fuel Cell.

Text Books:

1. Kirpal Singh, Automobile Engineering, Vol.1&2, Standard Publications, 13/e, 2020.
2. William.H.Crouse, Automotive Mechanics, 10/e , McGraw-Hill, 2006.

Reference Books:

1. Bosch, Automotive Hand Book, 6/e, SAE Publications, 2007.
2. K. Newton and W. Steeds, The motor vehicle, 13/e, Butterworth-Heinemann Publishing Ltd, 1989.
3. Joseph Heitner, Automotive Mechanics Principles and Practices, 2/e, CBS publishing 2004 .
4. David A. Corolla, Automotive Engineering: Powertrain, Chassis System and Vehicle Body, Butterworth-Heinemann Publishing Ltd, 2009.
5. Richard Stone, Jeffrey K. Ball, Automotive Engineering Fundamentals" SAE International, 2004

Web References:

1. https://archive.nptel.ac.in/courses/107/106/107106088/
2. https://nptel.ac.in/courses/107106088

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COMPUTER NETWORKS LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0523P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Understand the basic concepts of Computer Networks
- Understand the functionalities of various layers of OSI model
- Apply the data link layer framing mechanisms
- Apply the error detection mechanisms
- Implement the routing protocols.

Course Outcomes(CO):

On completion of this course, student will be able to

- Use the basic components of a Computer Networks
- Determine different hardware devices in computer networks
- Determine the data link layer framing mechanisms
- Use the error detection mechanisms
- Apply the shortest routing protocols to transmit data
- Determine spanning tree for a subnet

Syllabus | **Total Hours:48**

List of Experiments:

Experiment 1:
Explain the basic networking commands.

Experiment 2:
Explain about network devices such as repeaters, hub, switch, bridge, router and gateway.

Experiment 3:
Implement the data link layer framing method as character count

Experiment 4:
Implement the data link layer framing method as character stuffing

Experiment 5:
Implement the data link layer framing method as bit stuffing

Experiment 6:
Implement parity check method.

Experiment 7:
Implement on a data set of characters the CRC polynomials CRC 12

Experiment 8:
Implement Dijkstra's algorithm to compute the shortest path through a graph

Experiment 9:
Implement distance vector routing algorithm.

Experiment 10:
Implement leaky bucket algorithm.

Reference Books:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

Web References:

1. https://onlinecourses.swayam2.ac.in/cec19_cs07/preview
2. https://onlinecourses.nptel.ac.in/noc20_cs23/preview

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DESIGN AND ANALYSIS OF ALGORITHMS LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0524P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Implement searching and sorting mechanisms.
- Design and implement efficient algorithms for a specified application.
- Strengthen the ability to identify and apply the suitable algorithm for the given real world problem

Course Outcomes(CO):

On completion of this course, student will be able to

- Apply binary search and implement them
- Apply sorting mechanisms
- Apply Divide and Conquer method to different problems and implement them
- Apply Greedy Method to different problems and compute their time complexity
- Apply Dynamic Programming method to different problems and implement them
- Apply Backtracking method to different real-world problems

Syllabus — **Total Hours:48**

List of Experiments

Experiment 1:
Implementation of binary search

Experiment 2:
Implement of quick sort

Experiment 3:
Implementation of Finding Maximum and minimum

Experiment 4:
Implementation of Optimal solution for a Knap Sack Problem using Greedy Method.

Experiment 5:
Implementation of minimum cost spanning tree using Prim‟s Algorithm.

Experiment 6:
Implementation of minimum cost spanning tree using Kruskal‟s Algorithm.

Experiment 7:
Implementation of All pairs shortest path problem using dynamic programming.

Experiment 8:
Implementation of Optimal solution for a 0/1 Knap Sack Problem using dynamic programming.

Experiment 9:
Implementation of sum of subsets problem using back tracking.

Experiment 10:
Implementation of n-queen's problem using back tracking.

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd.

Web References:

1. https://onlinecourses.nptel.ac.in/noc19_cs47/preview
2. https://nptel.ac.in/courses/106106131

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FULL STACK DEVELOPMENT
(Common to CSE, AIML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0525P	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PEC

Course Objectives:

This course will enable students to:

- To Learn the core concepts of both the frontend and backend programming course
- To Get familiar with the latest web development technologies
- To Learn all about NoSQL databases
- To Learn complete web development process

Course Outcomes(CO):

On completion of this course, student will be able to

- Build a custom website with HTML, CSS, and little JavaScript.
- Demonstrate the usage of fundamental concepts to implement simple applications in ReactJS
- Practice on the real time application implementation using React JS.
- Implement real time applications practice using ReactJS , API's and calling NodeJS
- Demonstrate the usage of Mongo DB concepts to implement CRUD operations

Syllabus		Total Hours:48
Module-I	**Overview of HTML, CSS and JAVA SCRIPT**	**10Hrs**

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;
Client-side Scripting: Introduction to JavaScript, JavaScript language – declaring variables, scope of variables, functions. event handlers (on click, on submit etc.), Document Object Model, Form validation

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features
2. Make the above web application responsive web application java script on Click and on Submit
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 and experiment 2

Module-II	Introduction to ReactJS	9Hrs

Introduction, ES6 Features, Advanced Javascript, React Native, React vs React Native, Styling & Layout, Original DOM vs Virtual DOM, Elements, Components, React Components with JSX, Refactor, App Setup (Resources), Component Architecture,

1. Installation of reactJs with resources setup in windows and Linux
2. Build a simple search filter functionality to display a filtered list based on the search query entered by the user
3. Create a simple React component that displays "Hello, World!" on a web page.
4. Create a react application for the student management system having registration

Module-III	ReactJS Components and Forms	10Hrs

Functional Components, State Management, Forms, Table, Events, Applying Filters, Redux Store, Reducer, Validations, Backend calls, Stateful/Stateless Components, Applying Styles, Local Storage, Routing /Parameters Routing/ Gaurds, Master Pages, Prop-Types, Lifecycle Methods, Component State Navigation (Resources)

1. Create a form in React that captures user input (e.g., name and email) and displays it below the form

2. Creating a simple counter using React which increments or decrements count dynamically on-screen as the user clicks on the button
3. Create a react application for the student management system having login, contact, about pages and implement routing to navigate through these pages and validate it.

Module-IV	ReactJS UI and API's	9Hrs

Browser-Router, Link, UI Setup, REST API , Store, Reducer, Actions, Redux Dev Tool, Integration of Maps, Calling Node API service calls, Material UI

1. Write a simple code to Integrate the Google Maps API into React Applications
2. Fetch data from a REST API (e.g., a list of users) and display it in a table using React
3. Create a service in react that fetches the weather information from open weathermap.org and the display the current and historical weather information using graphical representation using chart.js

Module-V	Introduction to Mango DB	10Hrs

Introduction to NoSQL Database, Introduction & Overview of MongoDB, MongoDB Installation CRUD Operation in MongoDB, Data Modeling, Storage Classes, Indexing and Performance Considerations, Aggregation,MongoDB Replication

1. Installation of MongoDB on Windows & Linux.
2. Implementation of mongo Shell, Create database and display the database.
3. Execute the Commands of MongoDB and operations in MongoDB: Insert, Query, Update, Delete and Projection.
4. Implementation of Where Clause, AND, OR operations in MongoDB.
5. Execute Aggregation Pipeline and its operations.

Text Books:

1. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, 2 nd Edition, A Press.

Reference Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2nd Edition, 2008.

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DESIGN THINKING AND INNOVATION
(Common to CSE, AIML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0526	2: 0:0:0	2	CIE:30	-	MC

Course Objectives:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes(CO):

On completion of this course, student will be able to:

- Define the concepts related to design thinking.
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors.
- Analyse to work in a multidisciplinary environment
- Evaluate the value of creativity
- Formulate specific problem statements of real time issues

Syllabus		Total Hours:48
Module-I	**Introduction to Design Thinking**	**9Hrs**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

Module -II	Design Thinking Process	9Hrs

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

Module -III	Innovation	10Hrs

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

Module -IV	Product Design	10Hrs

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies. Activity: Importance of modelling, how to set specifications, Explaining their own product design.

Module -V	Design Thinking in Business Processes	10Hrs

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs.

Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Text Books:

1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons

Reference Books:

1. Design Thinking in the Classroom by David Lee, Ulysses press
2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H

Web References:

1. https://onlinecourses.swayam2.ac.in/aic23_ge17/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg32/preview
3. https://onlinecourses.nptel.ac.in/noc20_de03/preview