

**MALNAD COLLEGE OF ENGINEERING,
HASSAN**

(An Autonomous Institution Affiliated to VTU, Belagavi)



**Autonomous Programmes
Bachelor of Engineering**

**DEPARTMENT OF COMPUTER SCIENCE
AND ENGINEERING**

SYLLABUS

V Semester & VI Semester

(THIRD YEAR)

Academic Year 2023-2024

VISION

To become a prominent department of Computer Science & Engineering producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

MISSION

- Impart world class engineering education to produce technically competent engineers.
- Provide facilities and expertise in advanced computer technology to promote research.
- Enhance Industry readiness and entrepreneurial abilities through innovative skills
- Nurture ethical values and social responsibilities

PROGRAM EDUCATIONAL OBJECTIVES

- PEO 1 : Graduates will be efficient software developers in diverse fields and will be successful professionals and/or pursue higher studies.
- PEO 2 : Graduates will be capable to adapt to new computing technology for professional excellence and Research and will be lifelong learners.
- PEO 3 : Graduates will work productively exhibiting ethical qualities for the betterment of society.
- PEO 4 : Graduates will possess leadership qualities, work harmoniously in a team with effective communication skills

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Upon graduation, students with a degree B.E. in Computer Science & Engineering will be able to:

PSO – 1: To make the students industry ready by facilitating them with software tools in recent technologies

PSO – 2: To develop IT based solutions for problems in diverse domains

Scheme & Syllabus for III Year 2021 Admitted Batch

FIFTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
HSMC	21CS501	Technology Management and Entrepreneurship	2-2-0	3	4
PCC	21CS502	Operating Systems	2-2-0	3	4
PCC	21CS503	Data Communications	3-0-0	3	3
PCC	21CS504	Computer Graphics and Visualization	2-0-2	3	4
PCC	21CS505	Database Management Systems	3-0-0	3	3
PCC	21CS506	Database Applications Laboratory	0-0-2	1	2
OEC	21CS507X	Ability Enhancement Course	0-0-2	1	2
PEC	21CS55X	Elective – I	3-0-0	3	3
HSMC	21SCR	Social Connect and Responsibility	0-2-0	1	2
HSMC	21EVS	Environmental Studies (Mandate Non-Credit course)	0-2(A)-0	AUDIT	2
Total				21	29

Sl. No.	Elective – I	
	Course Code	Course Title
1.	21CS551	Artificial Intelligence
2.	21CS552	Data Mining
3.	21CS553	Internet of Things
4.	21CS554	Object Oriented Modeling and Design
5.	21CS555	Advanced Java
6.	21CS556	Operations Research

Sl. No.	Ability Enhancement Course	
	Course Code	Course Title
1	21CS507A	R Programming
2	21CS507B	UI/UX Laboratory
3	21CS507C	Full Stack Development
4	21CS507D	Version Controller with GiT

SIXTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P	Credits	Contact Hours
PCC	21CS601	Machine Learning	3-0-0	3	3
PCC	21CS602	Web Programming	2-0-2	3	4
PCC	21CS603	Computer Networks	3-0-0	3	3
PCC	21CS604	Application Development Laboratory	0-0-2	1	2
PCC	21CS605	Machine Learning Laboratory	0-0-2	1	2
PI	21CS606	Mini Project	0-0-4	2	4
PEC	21CS66X	Elective – II	3-0-0	3	3
OEC	21OE65XX	Open Elective – I	3-0-0	3	3
PI	21INT2	Summer Internship –II	0-0-30	3	30
OEC	21ASK	Analytical Ability and Soft Skills	0-2-0	1	2
SMC	21CIP	Constitution of India and Professional Ethics (Mandate Non-Credit Course)	0-2(A)-0	AUDIT	2
OEC	21SWY	SWAYAM (NPTEL Only)	2-0-0	AUDIT	-
Total				23	58
21CS606 - Mini Project: Students must develop a web based application using the concepts learnt in the courses - Database Management System (21CS505) and Web Programming (21CS602)					

Sl. No.	Elective - II	
	Course Code	Course Title
1.	21CS661	Pattern Recognition
2.	21CS662	Digital Image Processing
3.	21CS663	Wireless Networks
4.	21CS664	Software Architecture
5.	21CS665	C# Programming and .NET
6.	21CS666	Management Information System

Sl. No.	Open Electives	
	Course Code	Course Title
1.	21OECS61	Introduction to Cloud Computing
2.	21OECS62	Introduction to JAVA programming

Course Title	TECHNOLOGY MANAGEMENT AND ENTREPRENEURSHIP		
Course Code	21CS501	L-T-P-C	(2-2-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To lead and manage teams, become entrepreneur and to prepare project proposal.			
Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore corporate culture and building impressive profiles	10	-
2.	Develop motivation and management skills	9, 11	-
3.	Inculcate skills for Entrepreneurship and Start ups	6, 7	-
4.	Impart knowledge on IPR and R&D in technology industries	1, 4	-
5.	Inculcate the skills of building project proposal	1,11	-
Course Contents:			
MODULE – 1			10Hrs
Planning, and Decision making: Planning: Preview. Nature of planning, the foundation for planning, some planning concepts. Decision Making: Preview. Nature of decision making., types of decisions/decision making. Some human aspects of organizing: Preview. Staffing technical organizations. Authority and power. Delegation.			
MODULE – 2			10Hrs
Motivating & Leading Technical People and Controlling: Motivating and leading technical people: Preview. Motivation. Leadership. Motivating and leading technical professionals (methods). Managing the Research Functions: Preview. Product and technology life cycles. Nature of R & D. Research strategy and organization. Selecting R & D projects. Protection of ideas. Intellectual Property Rights (IPR). Creativity.			
MODULE – 3			10 Hrs
Entrepreneurship: Meaning, evolution of the concept, functions of an Entrepreneur, Characteristics of an Entrepreneur, types of entrepreneurs, Intrapreneur. Entrepreneurship: Concept of Entrepreneurship, Characteristics of Entrepreneurship, Development of Entrepreneurship, Stages in Entrepreneurial process, Role of Entrepreneurs in economic development, Entrepreneurship in India, Entrepreneurship barriers, Women entrepreneur – Concept & steps to develop Women Entrepreneur. Small Scale Industry: Definition, Characteristics, Objectives, Scope and role of SSI in economic Development, Advantages of SSI, Problems of SSI, Steps to start an SSI.			
MODULE – 4			10 Hrs
Government Policy towards SSI; Different Policies of SSI, Introduction to GATT/ WTO. Supporting Agencies of Government for SSI: Meaning, Nature of support; Objectives, functions. Ancillary Industry and Tiny Industry. Institutional Support: Different Schemes: SSIDC, SSIB, DICs/ Single Window Concept, TCOs, ICICI, NSIC, SIDO, IDBI, SIDBI, SFCS, IFCI. Preparation of Project: Meaning, Project identification, Project selection, Project Report - Need of Project, Contents; formulation, Network Analysis Errors of project report, Project Appraisal, Feasibility Study-Market Feasibility Study, Technical Feasibility Study, Financial Feasibility Study, Social Feasibility Study			

Text Books:

1. Daniel Babcock & Lucy C. Morse, “Managing Engineering and Technology”, PHI, 6th edition, 2014.
2. Management and Entrepreneurship- N.V.R Naidu, T Krishna Rao.

Reference Books:

1. Entrepreneurship Development, Small Business Enterprises – Poornima. M. Charantimath, – Pearson Education – 2006.
2. Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House.
3. Management Fundamentals - Concepts, Application, Skill Development – Robers Lusier, Thomson.
4. Principles of Management – P. C. Tripathi, P.N. Reddy – Tata McGraw Hill.

MOOCs:

1. <https://nptel.ac.in/courses/110/106/110106141>
2. <https://nptel.ac.in/courses/127/105/127105007>

OPERATING SYSTEMS			
Course Code	: 21CS502		LTPC : (2-2-0)3
Exam. Hours	: 3		Hours / Week :04
SEE	: 50 Marks		Total hours :40
Course Objective : Students should recognize critical resources of operating system and schedule the resources appropriately.			
Course Outcomes (COs) : Upon completion of the course, students shall be able to :			
COs	Statement	Mapping to POs	Mapping to PSOs
1.	Identify fundamental concepts in designing the operating system	1	-
2.	Apply resource management strategies in designing operating system	1, 3	-
3.	Compare various resource scheduling techniques	2, 3	-
4.	Analyse synchronization and deadlock handling mechanisms	2	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction to Operating Systems, System structures: What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines.			
MODULE – 2			10 Hrs
Process Management: Process concept; Process scheduling; Operations on processes; Inter-process communication, Threads: Overview; Multithreading models; Threading issues. Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling; Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization.			
MODULE – 3			10 Hrs
Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Main Memory: Background; Swapping; Contiguous memory			

allocation; Paging; Segmentation. Virtual Memory Management: Background; Demand paging; Page replacement	
MODULE – 4	10 Hrs
File System Interface: File System: File concept; Access methods; Directory and Disk structure; Mass-Storage Structures: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management, Protection and Security: Access matrix implementation.	
Text Books:	
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Principles, 8 th edition, Wiley-India, 2012.	
Reference Books:	
1. D.M Dhamdhare: Operating systems - A concept based Approach, 2nd Edition, Tata McGraw- Hill, 2002.	
2. P.C.P. Bhatt: Operating Systems, 2nd Edition, PHI, 2006.	
3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 1990.	
MOOCs	
1.	http://nptel.ac.in/courses/106108101/
Activity:	
1	Consider the banking service and use the appropriate scheduling algorithm for the below scenarios. <ul style="list-style-type: none"> ➤ Physically handicap ➤ Senior citizen ➤ Lapsed token ➤ Based on token ➤ Different services offered by the bank
2	In an online shopping you wish to purchase an item which is out of stock. Apply producer consumer problem technique to address the given scenario
3	Simulate the concept of Dining-Philosophers problem.
4	Assume that your wardrobe is full and you want to replace with new ones. Make use of the available replacement technique and solve

Course Title	DATA COMMUNICATIONS		
Course Code	21CS503	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students able to gain knowledge of TCP/IP Protocol Model and Functionalities of Data link Layer and Physical Layer			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Perceive the different types of Networks and demonstrate the responsibility each layer of TCP/IP protocol suite.	1,12	-
2.	Enumerate signal transmission along with impairments and performance analysis	2,3	-
3.	Explore the concept of data and signal with different techniques	1,2	-
4.	Review and analysis of bandwidth utilization and transmission media	2,4	-
5.	Investigate the Switching Techniques and addressing methods, and design error detection/ correction algorithms	3,4	-
6.	Formulate and analyse the functionalities of different framing formats, medium Access control Methods	2,4	-
Course Contents:			
MODULE-1			10 Hrs.
Introduction: Data Communications; Networks; Network Types; Network Models: Protocol Layering; TCP / IP Protocol Suite; Physical Layer: Introduction to Physical Layer, Data and Signals; Periodic Analog Signals; Digital Signals; Transmission impairment; Data rate limits;			
MODULE-2			10 Hrs
Digital Transmission: Digital-to-Digital conversion: Line Coding, Line Coding Schemes, Block Coding, and Scrambling; Analog-to-Digital conversion: Pulse Code Modulation (PCM), Delta Modulation(DM); Multiplexing: FDM, WDM, TDM, Multiplexing ; Spread spectrum			
MODULE-3			10 Hrs
Transmission Media: Twisted pair cable, Coaxial cable, Fiber-Optic cable, Radio waves, Microwaves, Infrared. Switching: Introduction; Circuit-Switched Networks: Three Phases and Delay; Packet Switching: Datagram Networks: Virtual Circuit Networks; Introduction to Data-Link Layer: Link-layer Addressing: Three Types of Addresses, Address Resolution Protocol (ARP); Error Detection and Correction: Introduction; Block coding: Error Detection; Cyclic codes: CRC, Polynomials, Cyclic Code Encoder using Polynomials, Cyclic Code Analysis, Checksum: Concept, Other Approaches to the Checksum; Forward Error Correction.			
MODULE-4			10 Hrs
Data Link Control: DLC Services: Framing, Flow and Error control, Connectionless and Connection Oriented; Data Link Layer Protocols: Simple, Stop & Wait, Piggybacking; HDLC; Point to Point Protocol: Services and Framing; Media Access Control: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA; Controlled Access: Reservation, Polling, Token Passing; Channelization: FDMA, TDMA, CDMA.			
Text Book:			
1. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 5th Edition. (Chapters 1.1,1.2,.1.3, 2, 3, 4.1,4.2, 6, 7, 8, 9, 10, 11,12, 13)			

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja, “Communication Networks–Fundamental Concepts and Key architectures”, Tata McGraw- Hill, 2nd Edition.
2. William Stallings, “Data and Computer Communication”, Pearson Education, 8th Edition

MOOC:

1. http://nptel.ac.in/keyword_search_result.php?word=data+communication

Course Title	COMPUTER GRAPHICS AND VISUALIZATION		
Course Code	21CS504	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: To learn the concepts of computer graphics to design a 2D and 3D scene using OpenGL. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping toPOs	Mapping to PSOs
1.	Identify core concepts of computer graphics with OpenGL.	1, 2	-
2.	Apply concepts of geometric transformations, projections, and illumination to render image.	2, 3, 4, 5	1
3.	Analyze various models and algorithms of illumination	2, 3, 5	-
4.	Design a 2D/3D image using graphical concepts through OpenGL.	1, 2, 3, 4, 5	2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface; Graphics architectures; Graphics Programming: The Sierpinski gasket; Programming two - dimensional applications. The OpenGL: The OpenGL API; Primitives and attributes; <i>Self Study: Pen Plotter Model</i>			
MODULE – 2			10 Hrs
The OpenGL (Continued): Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket. Input and Interaction: Interaction; Input devices; Clients and Servers; Display lists; Display lists and modeling; Programming event-driven input; Menus <i>Self Study: Design of Interactive programs, Animating interactive programs.</i>			
MODULE – 3			10 Hrs
Geometric Objects and Transformations: Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices <i>Self Study: Scalars, points, and vectors, Interactive mesh displays.</i>			
MODULE – 4			10 Hrs
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal Lighting and Shading: Light and matter; Light sources; The Phong lighting model; Polygonal shading; Light sources in OpenGL; Specification of materials in OpenGL Implementation: Clipping; Line- Segment Clipping; Bresenham's algorithm <i>Self Study: Approximation of a sphere by recursive subdivisions, Shading of the sphere model</i>			

Text Book:

1. Edward Angel, "Interactive Computer Graphics A Top-Down Approach with OpenGL", Addison-Wesley, 5th Edition, 2013. (Chapters 1, 2, 3, 4, 5, 6, 7)

Reference Books:

1. F.S. Hill, Jr, "Computer Graphics Using OpenGL", Pearson education, 2nd Edition, 2011.
2. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, "Computer Graphics", Addison-wesley.

MOOCs:

1. http://nptel.ac.in/keyword_search_result.php?word=computer+graphics?
2. <https://www.edx.org/course/computer-graphics-uc-san-diego-cse167x-3>
3. <https://www.mooc-list.com/course/interactive-computer-graphics-coursera>

Activity:

1. To recursively subdivide a tetrahedron to form 3D Sierpinski gasket. The number of recursive steps is to be specified by the user
2. To draw a Rocket and allow the user to change the color.
3. To create a house like figure and rotate it about a given fixed point using OpenGL functions
4. To draw a color cube and spin it using OpenGL transformation matrices
5. To create a cylinder and a parallelepiped by extruding a circle and quadrilateral respectively. Allow the user to specify the circle and the quadrilateral.
6. To clip the line PQ against the window coordinates (0,0) and (10,10). P=(-8,2) and Q=(2,14) using Liang Barsky line clipping algorithm.
7. To clip the line segment A(-4,2) and B(-1,7) in a window defined by left bottom corner at (-3,1) and upper right corner at (2,6). Find the visible portion of the line segment using Cohen Sutherland line clipping algorithm.

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	21CS505	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Design a database and write SQL queries.			
Course Outcomes(COs): Upon completion of the course, students shall be able to			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Apply knowledge of database concepts in designing database	1	-
2	Analyze a problem, in identifying appropriate computing requirements to get a solution	2	-
3	Formulate SQL queries to perform database operations	3,12	-
4	Design a database for a given scenario using appropriate techniques	3	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Introduction; An example; Characteristics of Database approach; Actors on the screen; Advantages of using DBMS approach. Data models, schemas and instances; Three-schema architecture and data independence; Database languages and interfaces; The database system environment; Centralized and client-server architectures; Classification of Database Management systems. Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An sample Database Application; Entity Types, Entity Sets, Attributes and Keys. Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions and Design Issues.			
MODULE – 2			10 Hrs
Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN-variations of JOIN, OUTER JOIN operations. SQL: SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval queries in SQL;			
MODULE – 3			10 Hrs
Continued: Insert,Delete and Update statements in SQL; Additional features of SQL, More complex SQL Retrieval Queries; Views; Schema Change Statements in SQL. Database Design-1: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys-1NF,2NF,3NF.			
MODULE – 4			10 Hrs
Database Design-2: Transaction management: The ACID Properties- Consistency and Isolation, Atomicity and Durability; Transactions and Schedules; Concurrent Execution of Transactions- revalorization for Concurrent Execution , Serializability , Anomalies Due to Interleaved Execution , Schedules Involving Aborted Transactions; Concurrency control- 2PL, Serializability, and Recoverability , View Serializability; Introduction to Lock Management - Implementing Lock and Unlock Requests			
Text Books: <ol style="list-style-type: none"> 1. Elmasri and Navathe, Fundamentals of Database Systems, Addison-Wesley, 7th Edition, 2015. 2. Raghuram Krishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill, 3rd Edition, 2007. 			

Reference Books:

1. Silberschatz, Korth and Sudharshan, Database System Concepts, 5th Edition, Mc-Graw Hill, 2006.
2. C.J. Date, A. Kannan, S. Swamynatham, An Introduction to Database Systems, Pearson education, 8th Edition, 2006.

MOOCs:

1. <http://nptel.ac.in/courses/106106093>
2. <https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x>

Course Code	DATABASE APPLICATIONS LABORATORY		
Course Code	21CS506	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Develop database application for real world scenarios.			
Course Outcomes(COs): Upon Completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Design and create relational schema	3,5	-
2	Implement queries using SQL	3	-
3	Design and develop database applications	3,5,6,8	1
EXERCISE PROGRAMS			
<p>1. Consider the following schema: EMPLOYEE (EmpNo, EmpName, Gender, Salary, Address, DNo, age) DEPARTMENT (DeptNo, DeptName, Location) Create Employee table with following constraints: Make EmpNo as Primary key, do not allow EmpName, Gender, Salary and Address to have null values, set the default salary value to Rs. 1000. Create Department table with following: Make DeptNo as Primary key, Make DeptName as candidate key, make DNo of Employee as foreign key which refers to DeptNo of Department Design a database to satisfy the above requirements and answer following queries:</p> <ol style="list-style-type: none"> List all the employees who are above 40 years of age List the employees who work in a particular department List the female employees who are 30 years of age and drawing salary >8000 			
<p>2. Consider the following schema: SUPPLIERS (Sid: integer, sname: string, address: string) PARTS (PID: integer, pname: string,color: string) CATALOG (Sid: integer, PID: integer, cost: real) Design a database to satisfy the above requirements and answer the following queries:</p> <ol style="list-style-type: none"> Find the names of parts for which there is some supplier. Find the names of suppliers who supply every part. Find the id's of suppliers who supply only red parts. 			
<p>3. Consider the following relations for an order processing database application in a company. CUSTOMER (cust #: int , cname: string, city: string) ORDER (order #: int, odate: date, cust #: int, ord-Amt: int) ORDER _ ITEM (order #: int, Item #:int, qty: int) ITEM (item # : int, unit price: int) SHIPMENT (order #: int, warehouse#: int, ship-date: date) WAREHOUSE (warehouse #: int,city: string). Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.</p>			

<p>a. Produce a listing: CUST#, #of orders, AVG_ORDER_AMT, where the middle column is the total numbers of orders by the customer and the last column is the average order amount for that customer.</p> <p>b. Create a view for average price of each item as average_item_price and number of quantities of that item as number_of_items.</p>
<p>4. Consider the following database of student enrolment in courses & books adopted for each course. STUDENT (Regno: string, name: string, major: string, bdate: date) COURSE (Course #: int, Cname: string, dept: string) ENROLL (Regno: string, course#: int, SEM: int, marks: int) BOOK _ ADOPTION (Course#: int, SEM: int, book-ISBN: int) TEXT (Book-ISBN: int, book-title: string, publisher: string, author: string) Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.</p> <p>a. Demonstrate how you add a new text book to the database and make this book beadopted by some department.</p> <p>b. Produce a list of text books (include Course #, Book-ISBN, Book-title) in the alphabetical order for courses offered by the 'CS' department.</p> <p>c. List any department that has all its adopted books published by a specific publisher.</p>
<p>5. Consider the Insurance database given below. The primary keys are underlined and the data types are specified. PERSON (driver – id #: String, name: string, address: string) CAR (Regno#: string, model:string, year: int) ACCIDENT (report-number#: int, date_of_acc: date, location: string) OWNS (driver-id #:string, Regno:string) PARTICIPATED (driver-id: string, Regno:string, report-number:int, damage amount:int). Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation.</p> <p>a. Demonstrate how you i. Update the damage amount for the car with report number 12. ii. Add a new accident to the database.</p> <p>b. Find the name of the person who is involved in maximum number of accidents in the year 2007.</p> <p>c. Find the number of accidents in which cars belonging to a specific model were involved.</p>
<p>6. Consider the following relations for the details maintained by a book dealer. AUTHOR (Author-id: int, Name: string, City: string, Country: string) PUBLISHER (Publisher-id: int, Name: string, City: string, Country: string) CATALOG (Book-id: int, title: string, author-id: int, Publisher-id: int, Category-id: int, Year: int, Price:int) CATEGORY (Category-id: int, Description: string) ORDER-DETAILS (Order-no : int, Book-id: int, Quantity: int)</p> <p>a. Create the above tables by properly specifying the primary keys and the foreign keys.</p> <p>b. Enter at least five tuples for each relation.</p> <p>c. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.</p> <p>d. Find the author of the book which has maximum sales.</p> <p>e. Demonstrate how you increase the price of books published by a specific publisher by 10%.</p>

<p>7. Consider a Video-Parlor database. The database holds members details, details of videos, details of copies of videos for rent, and details of video rentals by members. Design a database satisfying the above requirements and solve following queries as outlined below using SQL.</p> <ol style="list-style-type: none"> List only videos in the Children category with a daily rental rate of less than £4.00 and sorted according to video title. List the catalog No, title and category of the Video table, ordered by video title List all videos with a certification of “PG” or “18” in the Video table.
<p>8. Design a relational database for a real estate agency. It should store information about houses for sale, seller information, Buyer information, agents information (who can act on behalf of either the buyer or the seller), and the sale of houses. Answer the following queries in SQL.</p> <ol style="list-style-type: none"> What are the ids, addresses, asking_price, and selling_price of all houses that sold for less than the asking price? What are names of all of (prospective) buyers who have not bought a house? Each name should appear only once. Find the addresses and asking prices of all houses that have at least 3 bedrooms and two bathrooms that have not sold. Each address, asking price pair should appear only once.
<p>Activity: Design database for applications.</p>

Course Title	R Programming		
Course Code	21CS507A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To learn and Practice Programming techniques using R Programming. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	To understand the fundamental syntax of R and demonstration through readings and writing R code	1, 2	-
2.	To apply critical programming language concepts such as data types, iteration, control structures and functions by writing R programs and through examples	2, 3,4,5	-
3.	To import a variety of data formats into R using R-Studio	1, 2	-
Course Contents:			
Practice Programs:			
1. Installation of R Studio 2. Write an R Program to take input from the user (name and age) and display the values. Also print the version of R installation. 3. Write an R Program to get the details of the objects in memory. 4. Write an R Program to create a sequence of numbers from 20 to 50 and find the mean and product of numbers from 20 to 60 and sum of numbers from 51 to 91. 5. Write an R Program to multiply two vectors of integer's type and length 3.			
Guided Laboratory Experiments			
1. Write a program to check a year (integer) entered by the user is a leap year or not. 2. A shop keeper requires performing simple calculations like addition, subtraction, multiplication and modulo division for his daily business. Develop R program to perform these operation using switch cases and functions. 3. Write a program to perform searching within a list (1 to 5). If the number is found in the list, print that the search is successful otherwise print that the number is not in the list. 4. As a data analyst, you are tasked to analyze the three CIE conducted for 40 students. Find the total marks, average, maximum marks and minimum marks of six subjects. 5. As a data scientist, you are tasked with handling various matrices for a research project. Develop an R program to create three different matrices and populate them with data. For 5x4 and 3x3 matrix, fill the data by rows, and for the 2x2 matrix, fill the data by columns. Example: Matrix 1: 2x2 matrix with labels The matrix represents data gathered from two different subjects (rows) and two measurements (columns). Each row corresponds to a subject, and each column represents a different measurement (e.g., heart rate, blood pressure). 6. As a data analyst, you are responsible for merging data from two different departments within your organization. Each department has collected data in the form of matrices with the same number of columns but different numbers of rows. Develop an R program to concatenate these two matrices while preserving the column structure. 7. In your role as a data analyst at the healthcare organization, you have been tasked with organizing patient data into a structured format. You have collected four sets of data, each stored as a			

separate vector, which includes patient details such as patient ID, name, age, and medical condition. Write an R program to create data frame from these four vectors. After creating the data frame, you must save the data frame into a file to ensure data preservation and future access.

8. As a programmer at the digital security company, you have been assigned a critical task related to number encryption. Your task is to create an R program that calculates the sum of the digits of a given number using various looping techniques.
9. Create employee .CSV file having attributes such as Eid, name, salary, start_date and department. Perform various operation such as Reading, writing and analyzing (no. of rows and columns, max salary with and without person, specific department, joined on or before specific date)
10. As a teacher at a high school, you recently conducted a quiz for your students on five different subjects: Mathematics, English, Science, History, and Geography. Write an R program to create a simple bar plot for these five subjects to present the performance of your students.

Course Title	UI/UX LABORATORY		
Course Code	21CS507B	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	15
Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centered design, usability, and user experience. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	2	-
2.	Develop wireframes and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	5	-
Course Contents:			
<ol style="list-style-type: none"> 1. Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience. 2. Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes. 3. Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions. 4. Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience. 5. Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase. 6. Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labeling, and input validation to enhance user comprehension and completion rates. 7. Enhancing Mobile App Onboarding: Design an onboarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them through the setup process in a clear and engaging manner. 8. Redesigning a Checkout Process: Redesign the checkout process for an e-commerce website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience. 9. Designing an Error Page: Design a visually appealing and helpful error page for a website. Consider the tone of the message, provide relevant information or suggestions, and include navigational elements to guide users back on track. 10. Creating an Interactive Prototype: Use a prototyping tool to create an interactive prototype for a mobile app or website. Design key screens and transitions to showcase the user flow and interactions within the interface. 			

Course Title	FULL STACK DEVELOPMENT LABORATORY		
Course Code	21CS507C	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To gain a solid understanding of full-stack development fundamentals.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Study and Implement WebPages using Basic and Advanced HTML.	2, 5	-
2.	Develop a complete web application from scratch that includes Front-end, Backend and Data-exchange technologies.	3, 5	-
Course Contents:			
<ol style="list-style-type: none"> 1. HTML and CSS Webpage: Create a simple webpage that showcases your favorite hobby. Use HTML to structure the content and CSS to style the page, including adding colors, fonts, and images. 2. JavaScript Form Validation: Develop a web form with fields for name, email, and password. Implement JavaScript validation to ensure that all fields are filled correctly before submitting the form. 3. Node.js Server with Express: Build a basic server using Node.js and Express. Create routes to handle HTTP requests like GET and POST and respond with simple JSON data. 4. Database Integration: Extend the previous Node.js server by integrating a database (e.g., SQLite or MongoDB). Implement endpoints to perform CRUD operations on a dataset. 5. RESTful API: Design and implement a RESTful API using Node.js, Express, and a database of your choice. Define endpoints for managing resources, such as creating, reading, updating, and deleting data. 6. React Component Library: Create a library of reusable React components. Build components like buttons, cards, and modals and use them in a sample React application. 7. Full-Stack Task Manager: Develop a task manager application with React on the front end and Node.js/Express on the back end. Allow users to add, update, and delete tasks. 8. Authentication and Authorization: Add user authentication and authorization to the task manager application. Implement features like user registration, login, and protecting certain routes from unauthorized access. 9. Real-Time Chat Application: Build a real-time chat application using React for the front end and Node.js with Socket.IO for the back end. Enable users to send and receive messages in real-time. 			

Course Title	VERSION CONTROLLER WITH GiT		
Course Code	21CS507D	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	15
Course Objective: To use GitLab and Git and utilize it for software development.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamental concepts of version control systems and their importance in software development	1	-
2.	Demonstrate proficiency in using basic Git commands for initializing repositories, tracking changes, and committing code	5	-
Course Contents:			
MODULE – 1			7 Hrs
<ol style="list-style-type: none"> 1. Initializing a Repository: Initialize a new Git repository for a simple project. Add a few files to the repository and commit them. 2. Committing Changes: Make changes to the files in the repository and commit them. Practice creating meaningful commit messages 3. Creating and Switching Branches: Create a new branch in the repository, make changes in the branch, and switch between branches. 4. Merging Branches: Create a branch, make changes in both the main branch and the new branch, and merge the changes back into the main branch. 5. Resolving Merge Conflicts: Create a merge conflict by making conflicting changes in two different branches. Practice resolving the conflict using Git's conflict resolution tools. 6. Working with Remote Repositories: Clone a remote repository to your local machine. Make changes locally and push the changes back to the remote repository. 7. Collaborating with Others: Practice collaborating with others using Git. Clone a shared repository, make changes, push the changes, and pull changes made by others. 8. Reverting and Rolling Back Commits: Experiment with reverting commits and rolling back changes to a previous state in the repository using Git commands. 9. Tagging Releases: Tag a specific commit in the repository as a release version. Practice creating annotated tags and lightweight tags. 10. Ignoring Files: Create a .gitignore file to exclude certain files or directories from being tracked by Git. 11. Viewing Repository History: Use Git commands to view the commit history, explore differences between commits, and track changes made over time. 12. Branch Management: Practice creating, deleting, and renaming branches in the repository using Git commands. 			

Course Title	ARTIFICIAL INTELLIGENCE		
Course Code	21CS551	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge-based.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe different types of Artificial Intelligence agents, search strategies.	1	-
2.	Analyze different search strategies for a given problem.	2	-
3.	Design simple knowledge-based systems using first-order logic.	2	-
4.	Analyze different learning techniques.	3	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: What is AI? Intelligent Agents: Agents and environment; Good behavior: The Concept of Rationality; The nature of environment; The structure of agents. Problem-solving: Problem-solving agents. Example problems; Searching for solution; Uninformed search strategies: Breadth-first search, Uniform-cost search.			
MODULE – 2			10 Hrs
Uninformed search strategies: Depth-first search, Depth-limited search, Iterative deepening depth first search, Bidirectional search, Comparing uninformed search strategies; Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded heuristic search; Heuristic functions; Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing, Local beam search, Genetic algorithms.			
MODULE – 3			10 Hrs
On-line search agents and unknown Environments: Online search problems, Online search agents, online local search, learning in online search, Logical Agents: Knowledge-based agents; The Wumpus world; First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic.			
MODULE – 4			10 Hrs
Learning from Examples: Forms of Learning; supervised learning; Learning decision trees; Practical Machine Learning. Statistical and Reinforcement learning: Statistical learning, maximum likelihood parameter learning, Bayesian parameter, learning, passive reinforcement learning, active reinforcement learning.			
Text Book: 1. Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Third edition, Pearson, 2014.			
Reference Books: 1. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, Third edition, McGraw-Hill Education, 2015. 2. Introduction to Artificial Intelligence and Expert Systems, Dan W Patterson, Pearson, 2015.			

Course Title	DATA MINING		
Course Code	21CS552	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To understand the concepts of data mining and to apply the same for a given application.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the design of Data Warehousing.	1, 2	-
2.	Compare and contrast different data mining tasks	2, 3,4	-
3.	Analyze data related issues for successful data mining.	1, 2	-
4.	Evaluate models/algorithms with respect to their accuracy.	1, 3,4	-
Course Contents:			
MODULE – 1			10 Hrs
Data Warehousing: Introduction, Operational Data Stores (ODS), Extraction Transformation Loading (ETL), Data Warehouses, Design issues, Guidelines for Data Warehouse Implementation, Data Warehouse metadata. Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube, Data cube implementations, Data cube operations, Implementation of OLAP.			
MODULE – 2			10 Hrs
Introduction to Data Mining: What is Data Mining? Motivating Challenges, The origins of data mining, Data Mining Tasks, Types of Data, Data Pre-processing, Measures of Similarity and Dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, and Similarities between Data Objects.			
MODULE – 3			10 Hrs
Classification: Preliminaries; General approach to solving a classification problem; Decision tree induction; Rule-based classifier; Nearest-neighbor classifier, Association Analysis: Problem Definition; Frequent Item set generation; Rule Generation.			
MODULE – 4			10 Hrs
Association Analysis (cont...): FP-Growth algorithm, Evaluation of association patterns; Effect of skewed support distribution; Sequential patterns. Cluster Analysis: Overview, K-means, Agglomerative hierarchical clustering, DBSCAN.			
Text Books:			
1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, 1st Edition (Reprint) Pearson Education, 2014.			
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.			
Reference Books:			
1. Jiawei Han and Micheline Kamber, Data Mining – Concepts and Techniques, Morgan Kaufmann, 3rd Edition, 2012.			
2. K.P. Soman, Shyam Diwakar, V.Ajay, Insight into Data Mining – Theory and Practice, PHI, 2006			
MOOCs:			
1. http://nptel.ac.in/courses/110106064/			
2. http://nptel.ac.in/courses/106106093/			
3. https://www.edx.org/course/analytics-for-decision-making			

Course Title	INTERNET OF THINGS		
Course Code	21CS553	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Explore the interconnection and integration of the physical world and design IOT applications.			
Course Outcomes (COs) : Upon the completion of the course the students will be able to			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Analyze the impact and challenges posed by IoT networks and compare IoT architectures	1,2	-
2.	Identify smart objects, connectivity and IoT Access Technologies	1,2	-
3.	Appraise the role of IoT protocols for efficient network communication and Security in IoT network	2,3	-
4.	Adopt Raspberry Pi interface to develop IoT modules	2,3	2
5.	Employ security structures for IoT systems	1,3	-
Course Contents:			
MODULE - 1			10 Hrs
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, IoT Data Management and Compute Stack.			
MODULE – 2			10 Hrs
Smart Objects: The “Things” in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects: Communications Criteria, IoT Access Technologies.			
MODULE – 3			10 Hrs
IP as the IoT Network Layer: The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances. Application Protocols for IoT: The Transport Layer, IoT Application Transport Methods.			
MODULE – 4			10 Hrs
IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, Exploring the RaspberryPi Board; Operating System setup on RaspberryPi, RaspberryPi commands, Programming RaspberryPi with Python. Securing IoT: A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.			
Text Books:			
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1st Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)			
2. Srinivasa K G, Siddesh G M Hanumantha Raju R “Internet of Things”, CENGAGE Learning India, 2017.			

Reference Books:

1. Internet of Things - A Hands on Approach, Arshdeep Bahga and Vijay Madisetti Universities Press, 2015.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley ISBN: 978-1-119-99435-0, 370 pages, January 2012.

MOOCs:

1. <https://www.edx.org/course/introduction-to-the-internet-of-things-iot>
2. http://nptel.ac.in/noc/individual_course.php?id=noc17-cs22

OBJECT ORIENTED MODELING AND DESIGN				
Course Code	21CS554		L-T-P-C	(3-0-0)3
Exam Hours	3		Hours / Week	3
SEE	50 Marks		Total Hours	40
Course Objective :		Describe object oriented modeling concept and apply them to solve the problems.		
Course Outcomes (COs) :		Upon completion of the course, students shall be able to:		
COs	Statement		Mapping to POs	Mapping to PSOs
	Explore the basic concepts of object oriented modeling.		1,2	-
	Apply the object oriented concepts in modeling.		2,3	-
	Design the state diagrams and relationship between class and state models.		3	-
	Design use case models, sequence models and activity models.		3	-
	Select concepts of design pattern technologies.		2	-
Course Contents:				
Module 1			10 Hrs	
Introduction, Modeling Concepts, Class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; Modeling as Design Technique: Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced Class Modeling, State Modeling: Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes. Multiple inheritance; Metadata; Reification. Constraints; Derived data; Packages; Practical tips, State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.				
Module 2			10 Hrs	
Advanced State Modeling, Interaction Modeling: Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips, Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships.				
Interaction Modeling (contd.): Process Overview, System Conception: Procedural sequence models; Special constructs for activity models. Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; preparing a problem statement.				
Module 3			10 Hrs	
Domain Analysis, Application Analysis, System Design: Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; Adding operations, Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems.				
System Design (contd.), Class Design: Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example, Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms. Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; organizing a class design; ATM example.				
Module 4			10 Hrs	
Class Design (contd.), Implementation Modeling, Legacy Systems:. Class Design45				

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing. Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

Design Patterns: What is a pattern and what makes a pattern? Pattern categories; Relationships between patterns; Pattern description. Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber, Management Patterns: Command processor; View handler. Idioms: Introduction.

Text Books

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|----|--|
| 1. | Michael Blaha, James Rumbaugh, Object- Oriented Modeling and Design with UML, Pearson Education, 2nd Edition, 2005. (Chapters 1 to 17, 23). |
| 2. | Frank Buschmann, Regine Meunier, Hans Rohnett, Peter Sommerlad, Michael Stal, Pattern-Oriented Software Architecture- A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1,3.5,3.6,4). |

Reference Books

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|----|---|
| 1. | Grady Booch et al, Object-Oriented Analysis and Design with Applications, Pearson, 3rd Edition, 2007. |
| 2. | Booch G. Runbaugh J, Jacobson. I, The Unified Modeling Language User Guide, Pearson, 2nd Edition, 2005. |

ADVANCED JAVA				
Course Code	22CS555		LTPC	(3-0-0)3
Exam. Hours	3		Hours / Week	03
SEE:	50 Marks		Total hours	40
Course Objective:		Students should be able to use J2EE concepts to create an application.		
Course Outcomes(COs):		Upon completion of the course, students shall be able to :		
COs	Statement			POs
1.	Interpret the need for advanced Java concepts like enumerations and collections in developing modular and efficient programs			PO1,PO2, PO3
2.	Design java programs that can build GUI and handle events.			PO1, PO3
3.	Develop distributed web application using Servlets and JSP by applying the concepts of JDBC to perform operations on Database			PO1,PO2,PO3
Course Contents:				
MODULE – 1				10 Hrs
Enumeration and Autoboxing: Enumeration fundamentals, values() and valuesOf() Methods, Java Enumerations are class types, example, Type Wrappers, Autoboxing and Autounboxing. Event Handling The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes				
MODULE – 2				10 Hrs
User Interface components with Swing Components and containers, Layout managers, A first simple swing example, Event Handling, Creating a swing applet, Exploring Swing Controls-JLabel and ImageIcon, Jtextfield The Swing buttons, JTabbedPane, JScrollPane, JList, JCombobox.				
MODULE – 3				10 Hrs
The Collections Framework – Collections overview, The collection Interfaces, The collection classes, Accessing collection via an iterator. Database Access- The Concept of JDBC, JDBC Driver Types, JDBC Packages, A Brief Overview of the JDBC process, Database Connection, Statement Objects, Result Set				
MODULE – 4				10 Hrs
Servlets and JSP - Lifecycle of a sevelet, A simple servlet, The Servlet API, javax.servlet Package, Reading Servlet parameters, The javax.servlet.http Package, Handling HTTP Request and Responses, Using Cookies, Session tracking. Java Server Pages (JSP): JSP, JSP Tags, User Sessions, Cookies, Session Objects. RMI -. Java Remote Method Invocation: Remote Method Invocation concept; Server side, Client side.				
Text Books:				
1.	Herbert Schildt: Java The Complete Reference Eighth Edition, Mc Graw Hill, 2013.			
2.	Jim Keogh: J2EE The Complete Reference, Tata McGraw Hill, 2007.			
Reference Books:				
1.	Advanced Java Programming ,Uttam.K.Roy , Oxford Press,2015			
2.	Java Fundamentals Herbert Schildt Dale Skrien, Mc GrawHill 2013			
3.	"Head First Servlets and JSP" by Shroff,2nd Edition, O,Reilly Publications ,2008.			
MOOCs				
1.	http://www.nptelvideos.com/java/java_video_lectures_tutorials.php			
2.	https://www.youtube.com/watch?v=0KL_zftem4g/			

Course Title	OPERATIONS RESEARCH		
Course Code	21CS556	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Solve optimization problems using various methods			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation Linear Programming – 1: Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples			
MODULE – 2			10 Hrs
Simplex Method - 1: The Essence of the Simplex Method; Setting up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method Simplex Method – 2: Adapting to other Model Forms; Post Optimality Analysis, Computer implementation			
MODULE – 3			10 Hrs
Revised Simplex Methods: Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight Duality Theory: The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual Relationships , Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.			
MODULE – 4			10 Hrs
Transportation Model: Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm. Assignment Model and Network Models : The Assignment Model, CPM and PERT			
Text Books: 1. Frederick S. Hillier and Gerald J. Lieberman, “Introduction to Operations Research”, Tata McGrawHill, 9th Edition, 2012. (Chapters: 1.1 to 1.3, 2, 3.1 to 3.3, 4.1 to 4.7, 5, 6.1 to 6.7, 7.1) 2. Hamdy A Taha, “Operations Research: An Introduction”, Prentice Hall India, 8th Edition, 2005.(Chapters: 5, 6.4)			
Reference Book: 1. Wayne L. Winston, “Operations Research Applications and Algorithms”, Thomson Course Technology, 4th Edition 2003			

Course Title	SOCIAL CONNECT AND RESPONSIBILITY		
Course Code	21SCR	L-T-P	(0-2-0)1
Exam	3 Hrs.	Hours/Week	2
CIE	50 Marks	Total Hours	15
Course Objective: Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	6	-
2	Communicate and connect with their surroundings.	7,12	-
MODULE – 1			
Plantation and adoption of a tree: Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.			
MODULE – 2			
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms.			
MODULE -3			
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
MODULE -4			
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.			
Course Conduction			
A total of 14-20 hrs engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two faculty mentors . Faculty mentors will design the activities for evaluation.			
Guideline for Assessment Process: Continuous Internal Evaluation (CIE) After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor.			

Course Title	ENVIRONMENTAL STUDIES		
Course Code	21EVS	L-T-P-C	(0-2(A)-0)0
Exam Hrs.	3	Hours/Week	2
SEE	50 Marks	Total Hours	28
Course Objective:			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply with understanding the dimension of the societal health, safety, legal and cultural issues as engineer to the given Engineering problem of environmental concern.	6,8	-
2.	Evaluate the need for sustainable development having understood the adverse effects of present day development on the environment and by Self reflection on the individual day to day practices	7,12	-
3.	Develop and present report effectively as member/ leader of the team on the optimal use resources at individual and group level using modern tools.	5,9,10	-
4.	Demonstrate the adoption of ethics and lifelong practice of learning, the role and responsibility towards the environment as an engineering professional.	8,12	-
Course Contents:			
MODULE – 1			6 Hrs
Environment: Definition, Eco system – components of ecosystem, Balanced eco system. Impact of human activities on environment – Agriculture – Housing – Industry – Mining and Transportation.			
MODULE – 2			6 Hrs
Environmental Pollution: Water pollution-, Air pollution – Land pollution- Noise Pollution.			
MODULE – 3			8 Hrs
Global Environmental Issues: Water & Waste Water Management. Climate change and Global Warming, Acid rain & Ozone layer depletion: controlling measures. Land Management, Solid Waste Management, E – Waste Management & Biomedical Waste Management – Sources, Characteristics & Disposal methods, Population Growth, Urbanization			
MODULE – 4			8 Hrs
Environmental Protection- Legal aspects: Environmental impact assessment and sustainable development. Environmental Acts & Regulations- Water act and Air act. Role of government and Nongovernmental Organizations (NGOs) , Environmental Education & Women Education			
Text Books :			
1. R Rajagopalan, Environmental Studies – From Crisis to Cure, Oxford University Press, 2005			
2. S.M. Prakash, Environmental Studies, Elite publishers, Mangalore. 2007.			
Reference Books:			
1. Benny Joseph, Environmental Studies, Tata Mc Graw Hill			
2. P. Venugopala Rao, Principles of Environmental Science and Engineering, Prentice Hall of India			
3. P. Meenakshi, Elements of Environmental Science and Engineering, Prentice Hall of India Private Limited, New Delhi, 2006			
4. Erach Bharucha, Text Book of Environmental Studies, for UGC, University press, 2005			

Course Title	MACHINE LEARNING		
Course Code	21CS601	L-T-P-C	(3-0-0) 3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	50
Course Objective: To apply the techniques of machine learning for real time projects. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop a good understanding of fundamental principles of machine learning	1,2,3	-
2.	Formulation of a Machine Learning problem	1,2,4	-
3.	Develop a model using supervised/unsupervised machine learning algorithms for classification/prediction/clustering	2,3,4	-
4.	Evaluate the performance of various machine learning algorithms on various data sets of a domain.	4,5	-
MODULE - 1			10 Hrs
Introduction: What Is Machine Learning? Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised Learning. Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm. <i>Self Study: Reinforcement Learning.</i>			
MODULE – 2			10 Hrs
Dimensionality Reduction: Introduction, Subset Selection, Principal Component Analysis, Singular Value Decomposition and Matrix Factorization. Supervised Learning: Decision Tree learning, Representation, Algorithm, Issues in decision tree learning. <i>Self Study : Linear Discriminant Analysis.</i>			
MODULE - 3			10 Hrs
Supervised Learning: Support Vector Machine, K-Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions. Artificial Neural Networks: Neural Network Representation, Problems for Neural Network learning, Perceptron's, Multilayer Networks and Back Propagation Algorithms. <i>Self Study : Adaline Madaline.</i>			
MODULE – 4			10 Hrs
Unsupervised Learning: Introduction, Hierarchical Clustering, k-Means Clustering. Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. <i>Self Learning: Problems on Hierarchical Clustering.</i>			
Text Books: <ol style="list-style-type: none"> 1. Tom M. Mitchell, Machine Learning, McGraw-Hill Education (INDIAN EDITION), 2013. 2. Ethem Alpaydin, Introduction to Machine Learning, 2nd Ed., PHI Learning Pvt. Ltd., 2013 Reference Books: <ol style="list-style-type: none"> 1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Machine Learning, Pearson, 2019 2. T. Hastie, R. Tibshirani, J. H. Friedman, The Elements of Statistical Learning, Springer; 1st edition, 2001 3. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006 4. Yegnanarayana B. Artificial Neural Networks PHI Learning Pvt., Ltd. 			

Course Title	WEB PROGRAMMING		
Course Code	21CS602	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	50
Course Objective: Create web pages with client side and server-side scripting			
Course Outcomes (COs): Upon completion of the course, students shall be able to :			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the knowledge of HTML/XHTML and CSS in designing webpage.	1	2
2.	Develop client-side script to design webpage	3	2
3.	Design server-side script to create webpage	3,5	2
4.	Create web pages using JavaScript, xml, PHP and MySQL for the real world applications.	1,3,5	2
Course Contents:			
MODULE – 1			10 Hrs
Fundamentals of Web, XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP; the Web Programmers Toolbox. XHTML: Basic syntax; Standard structure; basic text markup; Images; Hypertext Links; Lists; Tables; Forms.			
MODULE – 2			10 Hrs
CSS: Introduction; Levels of style sheets; Selector forms; Property value forms; Font properties. List properties; Color; Alignment of text; The box model; Background images; Theand<div>tags. JavaScript: Overview of JavaScript; Syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input; Control statements; Object creation, and modification; Arrays; Functions; Pattern matching using regular expressions.			
MODULE – 3			10 Hrs
JavaScript and HTML Documents: The JavaScript execution environment; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The navigator object. Dynamic Documents with JavaScript: Introduction to dynamic documents; Element positioning; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor.			
MODULE – 4			10 Hrs
XML: Introduction; Syntax; Document structure; Namespaces, XML schemas, Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets. PHP: Origins and uses of PHP; Overview of PHP; General syntactic characteristics; Primitives, operations and expressions; Output; Control statements; Arrays; Functions; Pattern matching; Form handling; Cookies; Session tracking; Database Access using PHP and MySQL.			
Text Book:			
1. Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson Education, 2014.			
Reference Books:			
1. Deitel H.M. and Deitel P.J., “Internet and World Wide Web How to program”, Pearson International, 2012, 4th Edition.			
2. Randy Connolly, Ricardo Hoar, “Fundamentals of Web Development”, Pearson, 2015.			
3. ISRD Group: Internet Technology and Web Design, Tata McGraw Hill Publishing Ltd, 2011			
MOOCs:			
1. https://www.mooc-list.com/course/programming-and-web-beginners-coursera			

2. <http://nptel.ac.in/courses/117105080/3>
3. <https://www.coursera.org/specializations/web-design>
4. <http://www.w3c.org>

Activity:

Web programs are to be developed.

Course Title	COMPUTER NETWORKS		
Course Code	21CS603	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students able to acquire knowledge of working mechanisms of different types of Networks, Address Mechanisms and Protocols.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mappin gto PSOs
1.	Recognize the importance of the Network Layer Services and Network addressing mechanisms	1,12	-
2.	Identify and formulate the different Versions of Internet Protocols and IP Addresses	2	-
3.	Analyse and investigate the performance of Uncast and Multicast routing algorithms and their uses	2,4	-
4.	Design and apply the Transport Layer Protocols for different new services	4,5	-
5.	Apply and Investigate the use of different QoS models and their applications	1, 4	-
MODULE-1			10 Hrs
Network Layer: Network Layer Services, IPv4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, NAT; Network Layer Protocols: Internetwork Protocol: Datagram format, Fragmentation, Options, Security of IPV4 Datagrams; ICMPv4: Messages, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP;			
MODULE-2			10 Hrs
Unicast Routing: Introduction: General Idea, Least Cost Routing; Routing Algorithms: Distance Vector, Link-State Routing , Path-Vector Routing; Unicast Routing Protocols: Internet Structure, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol Version 4 (BGP4); Multicast Routing: Introduction: Unicasting, Multicasting, Broadcasting; MULTICASTING BASICS: Multicast Addresses, Delivery at Data-Link Layer, Collecting Information about Groups, Multicast Forwarding, Two Approaches to Multicasting;			
MODULE-3			10 Hrs
INTRADOMAIN MULTICAST PROTOCOLS: Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF) Protocol Independent Multicast (PIM); INTERDOMAIN MULTICAST PROTOCOLS: IGMP: Messages, Propagation of Membership Information, Encapsulation; Next Generation IP: IPV6 Addressing ,The IPV6 Protocol; Transport Layer protocols: Introduction: Services, Port Numbers, User Datagram Protocol(UDP): User Datagram, UDP Services, UDP Applications;			
MODULE-4			10 Hrs
Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, Windows in TCP ; Flow Control, Error Control, TCP Congestion Control; TCP Timer and Options; Stream Control Transmission Protocol (SCTP): Services, Features, Packet Format and Association; Quality of Services: Data Flow Characteristics; Flow Control to Improve QoS: Scheduling, Traffic Shaping or Policing, Resource Reservation, Admission Control; INTEGRATED SERVICES (INTSERV): Flow Specification, Admission, Service Classes, Resource Reservation Protocol (RSVP); DIFFERENTIATED SERVICES (DFFSERV).			
Text Book: 1. Behrouz A. Forouzan, Data Communications and Networking, Tata McGraw-Hill, 5th Edition (Chapters 14,15.3,16,17,18.1,18.4,19,20,21,22.1,22.2,24,30)			

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja, “Communication Networks–Fundamental Concepts and Key architectures”, Tata McGraw- Hill, 2nd Edition.
2. William Stallings, “Data and Computer Communication”, Pearson Education, 8th Edition.
3. Nader F. Mir, Computer and Communication Networks, Pearson Education, 2014.

MOOCs:

1. <http://nptel.ac.in/courses/106105081/>
2. <https://www.edx.org/course/computer-networks-internet-kironx-fhlcnx>

Course Title	APPLICATION DEVELOPMENT LABORATORY		
Course Code	21CS604	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Design and develop apps for android devices.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop simple applications, using built-in widgets and components of android studio.	5,9	1
2.	Document the apps designed.	10	-
Course Contents:			
<ol style="list-style-type: none"> 1. Develop an android application which accepts the SGPA of all the six semesters and displays your CGPA. 2. Develop an android application to login into a system which is redirected to the Home screen. The login should be successful on email: admin@example.com password: rtWi2p_10 If the email/password is invalid display a Toast with an error message 3. Assume you are accepting employee details: Name, Designation, Salary, Phone number. Develop app that displays an alert message if phone number entered is more than 10 digits. 4. Design an app that displays the names of all planets in our universe. Clicking on “Solar System” in first activity should display all the planet’s names in second activity and it should return the total number of planets to first activity. 5. Develop a QUIZ app that displays a question with four answers as options. Clicking an option should display whether the selected option is right or wrong. 6. Assume you need to accept order online for fast food items. Design an app such that it accepts the order for multiple items and displays the total amount to be paid on placing the order. 7. Design an app to display menu options on clicking a button “FILE”. The menu options are: New, Open, Save, Save as, And Print. Clicking on any option should display the relevant information. 8. Design an app to accept your name, roll number and branch programmatically. 9. Develop an android application to list all the engineering branches of MCE and displays a brief information of any department which the user clicks on in a separate page. 10. Consider a scenario where you need to send an email to multiple users. Design an app to implement the same. 11. Develop an android application to display a gallery view (Grid View) of at least 10 images. 12. Develop an android application to render the text data into Text View from the remote server. Show progress bar when the data is loading or Toast message if data fails to load. 			

Course Title	MACHINE LEARNING LABORATORY		
Course Code	21CS605	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours/Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Provide fundamental elements of Machine Learning algorithms and its applications.			
Course Outcomes(COs): Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Design and implement Machine Learning concepts and algorithms	2,3,4,5	1
2.	Implement and document Machine Learning programs	10	-
Course Contents:			
Practice Programs			
<ol style="list-style-type: none"> 1. Write a program to compute distance between two points taking input from the user. (Pythagorean Theorem) 2. Write a program that takes two numbers as command line arguments and prints its sum. 3. Write a Program for checking whether the given number is an even number or not. 4. Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, ..., 1/10. 5. Write a program to count the numbers of characters in the string and store them in a dictionary data structure. 6. Write a program to count frequency of characters in a given file. Use character frequency to tell whether the given file is a Python program file, C program file or a text file? 7. Find mean, median and mode for the given set of numbers in a list. 8. Write function to compute GCD, LCM of two numbers. 9. Write a program that defines a matrix and prints the same. 			
Exercise Programs			
<ol style="list-style-type: none"> 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. Write a program to 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 Back propagation algorithm and test the same using appropriate data sets. 5. Write a program to 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 API can be used to write the program. Calculate the accuracy, precision, and recall for your data set. 7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart/ lung patients using standard disease Data Set. 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. 9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions 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. 			

Activity:

1. Write a program to demonstrate the working of PCA.
2. Write a program to demonstrate the working of the SVD.
3. Write a program to demonstrate the working of the LDA.
4. Write a program to demonstrate the working of the SVM. Use an appropriate data set for building the SVM and apply this knowledge to classify a new sample.
5. Write a program to demonstrate the working of the Hierarchical Clustering. Use an appropriate data set for building the Hierarchical Clustering and apply this knowledge to cluster a new sample.

MINI PROJECT (Inter-Discipline)			
Course Code	21CS606	L-T-P-C	(0-0-4)2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	28
Course Objective : Identify, analyze and formulate problem statement for project work with systematic and comprehensive approach Course Outcomes (COs): Upon completion of course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Take a real-world problem, plan, and document the same	1,2,3,10	
2.	Design and conduct experiments and test against requirements and specifications.	1,3,4	1,2
3.	To present and communicate technical material through project demonstration and report.	1,5,10	
4.	Demonstrate the ability to work effectively as a project member.	1,9	
<ul style="list-style-type: none"> A team of TWO students must develop the mini project. However, during the final evaluation, each student must demonstrate the project individually. The team may implement a mini project of their choice. The team must submit a Brief Project Report (25 to 30 Pages) at the end which must include the following <ul style="list-style-type: none"> Introduction Requirements Development Process and Models Adopted Analysis and Design Models Implementation Testing The project report will be evaluated for 25 marks, Demonstration for 50 marks and Viva Voce for 25 marks. 			

Rubrics for Evaluation of Mini Project (Inter-Discipline)					
Phase I (Project Proposal Submission and Evaluation Scheme):					
After finalizing the topic with the guidance of Supervisor, students should submit the project proposal along with Synopsis not exceeding 10 pages. Approval of synopsis is done for 15 marks by concerned project committee.					
Sl. No	Performance Indicators	Needs Improvement (0-1 mark)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1	Literature Survey	Survey of literature is not recent or no literature survey	Survey of literature is not clear	Literature survey is sufficient.	5
2	Synopsis writing	Objective of the work is not identified.	Objective of the work is identified but no evidence of Inter disciplinary approach found.	Objective of the work is identified with evidence of Inter disciplinary approach found.	5
3	Presentation	Contents delivered not completely.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15

Phase II (Project Progress):					
Evaluation of project phase II is carried out by evaluation committee.					
Sl. No.	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1.	System design and development	System specification is not identified.	System specification is identified but not satisfactory.	System specification is identified correctly.	5
2.	Identification of appropriate tool for application	Application tools are not identified.	Application tools identified but not used.	Application tools identified and used.	5
3.	Oral presentation	Entire contents not delivered.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15
Phase III (Project Demonstration with Report):					
Evaluation of this phase is done by evaluation committee.					
Sl. No.	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Total marks allocated
1.	Design and Implementation	Not done.	Incomplete.	Complete.	5
2.	Demonstration	Incomplete.	Complete but not satisfactory.	Complete and satisfactory	5
3.	Documentation	Organization and clarity of report and technical content is not clear and complete.	Organization and clarity of report and technical content is clear but not complete.	Organization and clarity of report and technical content is clear and complete.	5
4.	Oral presentation	Presentation with ppt is not clear.	Presentation with ppt is clear but not satisfactory.	Presentation with ppt is clear and satisfactory.	5
Total					20

Semester End Evaluation				
Evaluation committee consists of panel of examiners containing external as well as internal evaluators. This evaluation is carried out for 50 marks.				
Sl. No.	Performance Indicators		Marks allocated	Marks awarded
1.	Project execution	Project specification	5	
		Progress	5	
2.	Methodology /Result Analysis	System Design	5	
		System Implementation	5	
		System Testing	5	
3.	Project Report	Organization and Clarity	5	
		Technical content	5	
		Conclusion and Future work	5	
Final presentation			10	
Total Marks			50	
Rubrics for Semester End Exam				
Marks	Overall criteria			
48-50	Project is reaching professional standards.			
40-47	Project is excellent and may contain publishable material. Presentation is excellent.			
35-39	Project and presentation are very good. All design aims are met.			
30-34	Project and presentation are good. Most design aims are met.			
25-29	Minimum core of design aims has been met. Presentation is satisfactory.			
20-24	Design aims and implementation are met partially. Presentation is moderate.			
0-20	Most design aims are not met and implementation does not work. Presentation is not satisfactory.			

PATTERN RECOGNITION			
Course Code	: 21CS661		L-T-P-C : (3-0-0)3
Exam Hours	: 3		Hours / Week : 3
SEE	: 50 Marks		Total Hours : 40
Course Objective :	Apply pattern recognition techniques to real world problems.		
Course Outcomes (COs) :	Upon completion of the course, students shall be able to:		
COs	Statement	POs	
1.	Choose appropriate pattern recognition algorithm for an application.	PO1, PO2	
2.	Choose an appropriate procedure for a particular application.	PO2	
3.	Analyze the methods and types of clustering.	PO3	
4.	Analyze and come out with results using proper technical terminology.	PO4	
5.	Solve real world problems on pattern recognition.	PO1,PO2	
Course Contents:			
Module 1			
Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.			
			5 Hrs
Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminate functions, and decision surfaces; The normal density; Discriminant functions for the normal density.			
			5 Hrs
Module 2			
Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.			
			5 Hrs
Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; kn – Nearest-Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.			
			5 Hrs
Module 3			
Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.			
			5 Hrs
Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.			
			5 Hrs
Module 4			
Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.			
			5 Hrs

Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.	
	5 Hrs
Text Books:	
	Richard O. Duda, Peter E. Hart, and David G. Stork, Pattern Classification, Wiley-Interscience, 2nd Edition, 2012.
Reference Books:	
	Earl Gose, Richard Johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, Pearson Education, 2007.

Course Title	DIGITAL IMAGE PROCESSING		
Course Code	21CS662	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective : To study the image fundamentals and mathematical transforms necessary for image processing along with image enhancement, restoration, compression and segmentation techniques Course Outcomes (COs) : Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the basic principles of Digital image processing	1,2	-
2.	Elucidate mathematical modeling of filtering and image restoration	2,3,5	-
3.	Apply concepts of Digital image processing using coloring model	2,3,4,5	-
4.	Analyze image processing algorithms	2,9,10,11	1
5.	Develop image processing application for real time problems	5,9,11	2
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Basic concepts, Examples of fields that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of visual perception. Image sensing and acquisition: Image sampling and quantization: Basic concepts in sampling and quantization, Representing digital images, Spatial and Intensity resolutions, some basic relationships between pixels: An Introduction to the Mathematical tools used in digital image processing.			
MODULE – 2			10 Hrs
Intensity Transformations and Spatial Filtering: Background: The basics of intensity transformations and spatial filtering, Some basic intensity transformation functions, Histogram Processing. Fundamentals of spatial filtering: The mechanics of spatial filtering, Spatial correlation and convolution. Image Restoration: A model of the image restoration/degradation process. Noise Models: Spatial and Frequency properties of Noise.			
MODULE – 3			10 Hrs
Image Restoration: Some important noise probability density functions, Periodic noise, Estimation of noise parameters, Restoration in the presence of Noise only- Spatial Filtering, Mean Filters. Color Image Processing: Color fundamentals, Color models: The RGB color model. Image Compression: Fundamentals: Coding redundancy, Spatial and Temporal redundancy, Irrelevant information, Measuring image information, Fidelity Criteria.			
MODULE – 4			10 Hrs
Image Compression: Some basic compression methods: Arithmetic coding, LZW coding, Bit_Plane coding, Digital image watermarking. Image Segmentation : Fundamentals, Point, Line, and Edge Detection, Background, Detection of Isolated Points, Line Detection, Edge Models, Basic Edge Detection: The Image Gradient and its Properties, Gradient Operators, Combining the Gradient with Thresholding, Thresholding: Foundation, The Basics of Intensity Thresholding, The Role of Noise in Image Thresholding, The Role of Illumination and Reflectance in Image Thresholding.			
Text Book: 1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, 4th Edition, Pearson publications, 2018			

Reference Books:

1. A.K. Jain, “Fundamentals of Digital Image Processing”, Pearson 2nd Edition, 2018.
2. B. Chanda , Dutta Majumdeer, “Digital Image Processing and Analysis”, Prentice-Hall of India Pvt.Ltd., 2nd Edition, 2011.
3. “Introduction to Digital Image Processing with Matlab”, Rafael C. Gonzales, Richard E. Woods, Steven L.Eddins, McGraw Higher Ed, 2nd Edition, 2010.

MOOC:

1. <http://nptel.ac.in/courses/106105032>

Course Title	WIRELESS NETWORKS		
Course Code	21CS663	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students able to gain knowledge of various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore fundamentals of wireless communications.	1,2	-
2.	Analyse security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks.	2,3	-
3.	Demonstrate basic skills for cellular networks design.	1,2	-
4.	Apply knowledge of TCP/IP extensions for mobile and wireless networking.	2,3	1
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Wired Network vs. Wireless Network, Overview of Wireless Applications, Wireless Transmission: Path loss, Multi-path propagation, Doppler shift, Fading, Time Division Multiplexing, Frequency Division Multiplexing, Code, Spread Spectrum Technique, Satellite Communication;			
MODULE – 2			10 Hrs
CELLULAR SYSTEM: Cellular Network Organization, Cellular System Evolution, Cellular Fundamentals: Capacity, Topology, Operation of Cellular Systems, Handoff, Power control, Case study: Global System for Mobile communication (GSM) Network, General Packet Radio Service (GPRS), Code Division Multiple Access (CDMA 2000), Cordless System, Wireless Local Loop, Mobility Management-Location Management, HLR-VLR scheme, Hierarchical scheme, Predictive location management schemes;			
MODULE – 3			10 Hrs
WIRELESS NETWORK: Protocols: Media Access Protocol, Mobile IP, Mobile Transport Layer Protocol, Wireless Access Protocol, Ad-Hoc Networks and Routing, Standards: IEEE 802.11, Wi-Fi, Wireless Broadband-Wi-MAX, Bluetooth, IEEE 802.15, Security in Wireless Network, Hyper LAN.			
MODULE – 4			10 Hrs
MOBILE COMPUTING: Mobile Computing, Issues: Resource Management, Interference, Bandwidth, Cell Splitting, Frequency reuse, Mobile Data Transaction Models, File Systems, Mobility Management, Security.			
Text Books :			
1. William Stallings, "Wireless Communications & Networks", 2/E, Pearson Education India, Reprint 2007. 2. Jochen Schiller, "Mobile Communications", 2/E, Pearson Education India, reprint 2007			
Reference Book:			
1. Sandeep Singhal, "The Wireless Application Protocol" , Addison Wesley, India, reprint 2001 2. T S Rappaport, "Wireless Communications: Principles & Practice", 2/E, Pearson Education, 2002. 3. C E Perkins, "Ad Hoc Networking", Addison Wesley, 2000.			
MOOCs:			
1. https://onlinecourses.nptel.ac.in/noc20_ee61/preview			

Course Title	SOFTWARE ARCHITECTURE		
Course Code	21CS664	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Provide students with the principles and concepts of applying various design patterns in designing a wide variety of software system. Course Outcomes (COs) : Upon the completion of the course the students will be able to :			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore the significance of software architecture.	1,2	-
2.	Apply quality attributes to create an architecture for the given application.	2,3	-
3.	Analyze the architectural pattern and build the system from components.	2,3	-
4.	Create documentation relevant to the chosen architecture.	1,10	-
Course Contents:			
MODULE – 1			10 Hrs
What Is Software Architecture? : What Software Architecture Is and What It Isn't; Architectural Structures and Views; Architectural Patterns; What Makes a "Good" Architecture? Why Is Software Architecture Important? Inhibiting or Enabling a System's Quality Attributes; Reasoning About and Managing Change ; Predicting System Qualities; Enhancing Communication among Stakeholders; Carrying Early Design Decisions ; Defining Constraints on an Implementation; Influencing the Organizational Structure ; Enabling Evolutionary Prototyping Improving Cost and Schedule Estimates ; Supplying a Transferable, Reusable Model; Allowing Incorporation of Independently Developed Components; Restricting the Vocabulary of Design Alternatives; Providing a Basis for Training; The Many Contexts of Software Architecture: Architecture in a Technical Context, Architecture in a Project Life-Cycle Context, Architecture in a Business Context, Architecture in a Professional Context, Stakeholders, How Is Architecture Influenced?, What Do Architectures Influence?, Quality Attributes Understanding Quality Attributes; Architecture and Requirements ; Functionality; Quality Attribute ; Considerations ; Specifying Quality Attribute; Requirements ; Achieving Quality Attributes through Tactics, Guiding Quality Design Decisions.			
MODULE – 2			10 Hrs
Availability: Availability General Scenario; Tactics for Availability; Modifiability: Modifiability General Scenario; Tactics for Modifiability Performance: Performance General Scenario; Tactics for Performance; Security: Security General Scenario; Tactics for Security ; Architectural Patterns – 1: Introduction; from mud to structure: Layers, Pipes and Filters.			
MODULE – 3			10 Hrs
Architectural Patterns – 2: Distributed Systems: Broker; Interactive Systems. Architectural Patterns – 3: Presentation-Abstraction-Control; Adaptable Systems: Microkernel;			
MODULE – 4			10 Hrs

<p>Some Design Patterns: Structural decomposition: Whole – Part; Organization of work: Master – Slave; Access Control: Proxy.</p> <p>Designing and Documenting Software Architectures: Design Strategy; The Attribute-Driven Design Method; The Steps of ADD; Uses and Audiences for Architecture; Documentation; Notations for Architecture; Documentation; Views; Choosing the Views; Combining Views; Building the Documentation Package; Documenting Behavior; Architecture Documentation and Quality Attributes; Documenting Architectures That Change Faster Than You Can Document Them.</p>
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3rd Edition, Addison-Wesley, 2013. 2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2009.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, 2008. 2. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns- Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.
<p>MOOCs:</p> <ol style="list-style-type: none"> 1. http://www.hillside.net/patterns 2. http://www.nptel.ac.in/syllabus/106104027 3. https://www.mooc-list.com/course/software-architecture-coursera

Course Title	C# PROGRAMMING AND .NET		
Course Code	21CS665	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to develop various console and windows applications.			
Course Outcomes(COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop programs that use reusability properties and namespaces.	3	-
2.	Design applications using classes, methods, interfaces and inheritance techniques and manage exceptions.	1, 3	-
3.	Create delegates, packages and manage database.	2, 3	-
4.	Demonstrate windows application system and build their own applications	3	1
Course Contents:			
MODULE – 1			10 Hrs
Overview of C#: Introduction , A Simple C# Program, Namespaces , Adding Comments, Main Returning a Value, Using Aliases for Namespace Classes, Passing String Objects to WriteLine Method, Command Line Arguments, Main with a Class, Providing Interactive Input, Using Mathematical Functions, Multiple Main Methods, Compile Time Errors. Literals, Variables and Data Types: Introduction, Literals , Variables , Data Types , Value Types Reference Types, Declaration of Variables , Initialization of Variables , Default Values ,Constant Variables , Scope of Variables , Boxing and Unboxing. Operators and Expressions : Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operator, Bitwise Operators , Special Operators ,Arithmetic Expressions, Evaluation of Expressions ,Precedence of Arithmetic Operators, Type Conversions ,Operator Precedence and Associativity. Mathematical Functions. Decision Making and Branching: Introduction, Decision Making with if Statement, Simple if Statement, The if... else Statement, Nesting of if... else Statements, The else if Ladder, The Switch Statement The? : Operator. Decision Making and Looping: Introduction, The while Statement The do Statement, The for Statement, The foreach Statement. Methods in C#: Introduction, Declaring Methods, The Main Method, Invoking Methods, Nesting of Methods, Method Parameters, Pass by Value, Pass by Reference, The Output Parameters, Variable Argument Lists, Methods Overloading. Handling Arrays: One-Dimensional Arrays, Creating an Array, Two- Dimensional Arrays, Variable- Size Arrays, the System. Array Class. Manipulating Strings : Creating Strings, String Methods, Inserting Strings, Comparing Strings, Finding Substrings, Mutable Strings, Arrays of Strings			
MODULE – 2			10 Hrs
Classes and Objects : Introduction, Basic principles of OOP, Defining a Class, Adding Variables and Methods, Member Access Modifiers, Creating Objects, Accessing Class members, Constructors, Overloaded Constructors, Static Members, Static Constructors, Private Constructors, Copy Constructors, Destructors, Member Initialization. Inheritance and Polymorphism: Introduction, Classical Inheritance, Containment Inheritance, Defining a Subclass, Visibility Control, Defining Subclass Constructors, Multilevel Inheritance, Hierarchical Inheritance, Overriding Methods, Hiding Methods, Abstract Classes, Abstract Methods, Sealed Classes: Preventing Inheritance, Sealed Methods, The this reference, Nesting of Classes, Constant Members, Read-only Members, Properties, Indexers. Polymorphism, Interface: Multiple Inheritance, Multiple Inheritance: Introduction, Defining an Interface, Extending an Interface, Implementing Interfaces, Interfaces and Inheritance, Explicit Interface Implementation, Abstract Class and Interfaces.			

Operator Overloading: Introduction, Over loadable Operators, Need for Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overloading Comparison Operators Delegates and Events: Introduction, Delegates, Delegate Declaration, Delegate Methods, Delegate Instantiation, Delegate Invocation, Using Delegates, Multicast Delegates, Events. Managing Errors and Exceptions: Introduction, What is Debugging? Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch statements, The Exception Hierarchy, General Catch Handler, Using Finally statement, Nested Try Blocks, Throwing our Own Exceptions, Checked and Unchecked Operators, Using Exceptions for Debugging.	
MODULE – 3	10 Hrs
<p>Understanding. NET: The C# Environment: Building a Better Window (Introducing Windows Forms): Overview of the System. Windows. Forms Namespace, Working with the Windows Forms Types, The Role of the Application Class ,The Anatomy of a Form, The Functionality of the Control Class, The Functionality of the Form Class, Building Windows Applications with Visual Studio 2005, Working with MenuStrips and ContextMenuStrips, Working with StatusStrips.</p> <p>Programming with Windows Forms Controls: The World of Windows Forms Controls, Adding Controls to Forms by and, Adding Controls to Forms Using Visual Studio 2005, Working with the Basic Controls, Configuring the Tab Order, Setting the Form's Default Input Button, Working with More Exotic Controls, Building Custom Windows Forms Controls, Testing the CarControl Type, Building a Custom CarControl Form Host.</p>	
MODULE – 4	10 Hrs
<p>Data Access with ADO.NET: A High-Level Definition of ADO.NET, Understanding, DO.NET Data Providers, Additional ADO.NET Namespaces, The System. Data Types, Abstracting Data Providers Using Interfaces, Increasing Flexibility Using Application ,Configuration Files, The .NET 2.0 Provider Factory Model, The <connectionStrings> Element Installing the Cars Database, Understanding the Connected Layer of ADO.NET, Working with Data Readers, Modifying Tables Using Command Objects, Working with Parameterized Command Objects, Executing a Stored Procedure Using DbCommand, Asynchronous Data Access Under .NET 2.0, Understanding the Disconnected Layer of ADO.NET.</p> <p>ASP.NET Web Pages and Web Controls: The Role of HTTP, Understanding Web Applications and Web Servers, The Role of HTML, The Role of Client-Side Scripting, Submitting the Form Data (GET and POST), Building a Classic ASP Page, Problems with Classic ASP, The ASP.NET 2.0 Namespaces, The ASP.NET Web Page Code Model, Details of an ASP.NET Website Directory Structure, The ASP.NET 2.0 Page Compilation Cycle, The Inheritance Chain of the Page Type, Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response, The Life Cycle of an ASP.NET Web Page, Understanding the Nature of Web Controls</p>	
<p>Text Books :</p> <ol style="list-style-type: none"> 3. Andrew Troelsen , “Pro C# and the .NET 3, Special edition, A Press, 2012 4. E. Balagurusamy, " Programming in C# A Primer", 3rd edition, TMH, 2010. 	
<p>Reference Book:</p> <ol style="list-style-type: none"> 1. Tom Archer: Inside C#, WP Publishers, 2001. 	
<p>MOOCs:</p> <ol style="list-style-type: none"> 2. https://www.udemy.com/course/c-net-for-beginners/ 3. https://www.udemy.com/course/aspnet-webforms/ 	

Course Title	MANAGEMENT INFORMATION SYSTEMS		
Course Code	21CS666	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems..			
Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	
1.	Relate the basic concepts and technologies used in the field of management information systems	9, 11	
2.	Compare the processes of developing and implementing information systems	6, 7	
3.	Outline the role of the ethical, social, and security issues of information systems	1, 4	
4.	Apply the understanding of how various information systems like DBMS work together to accomplish the information objectives of an organization.	1,11	
	Course Contents:		
MODULE – 1			10 Hrs
The meaning and use MIS, System View of Business, Process of MIS, Development of MIS within the organization, Management Process, Information Needs, System Approach in Planning Organizing and Controlling MIS.			
MODULE – 2			10 Hrs
System analysis and design: System - Need for system analysis - System analysis of the existing system - System analysis of a new requirements - System Development Model - Structured System Analysis and Design - Object Oriented Analysis.			
MODULE – 3			10 Hrs
MIS applications, DSS – GDSS - DSS applications in E enterprise - Knowledge Management System and Knowledge Based Expert System - Enterprise Model System and E-Business, E- Commerce, E-communication, Business Process Reengineering.			
MODULE – 4			10 Hrs
Technology of information system: Data process- Transaction and application process Information system process; Unified communication and network; Security challenges in E-enterprises; Security threats and vulnerability-Controlling security threat and vulnerability			
Text Books: <ol style="list-style-type: none"> 1. Jawadekar, W.S., “Management Information Systems”, Tata McGraw Hill Private Limited, New Delhi, 2009. 2. Kenneth C. Laudon and Jane P. Laudon: “Management Information Systems” 9/e, Pearson Education, New Delhi. Rference Books <ol style="list-style-type: none"> 1. Goyal, D.P.: “Management Information System”, MACMILLAN India Limited, New Delhi, 2008. 2. Mahadeo Jaiswal, Monika Mital: “Management Information System”, Oxford University Press, New Delhi. 			

Course Title	INTRODUCTION TO CLOUD COMPUTING		
Course Code	21OECS61	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to find out cloud computing service models and applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the knowledge for the identification of architecture and infrastructure for Cloud Computing.	2, 4	-
2.	Assessment of the economics, financial, and technological implications for selecting cloud deployment model	2, 4	-
3.	Choose appropriate cloud model for a given application	3, 5	-
4.	Identify security management in cloud	6, 8	-
5.	Develop applications for cloud computing	5, 7	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction: Cloud computing at a glance, historical developments, building cloud computing environments, computing platforms and technologies. Principles of parallel and Distributed computing: Eras of computing, parallel vs. Distributed computing, elements of parallel computing, elements of distributed computing, technologies for distributed computing.			
MODULE – 2			10 Hrs
Virtualization: Introduction, characteristics of virtualized environments, Taxonomy of virtualization techniques, virtualization and cloud computing, pros and cons of virtualization technology. Cloud Computing architecture: Introduction, Cloud reference model, types of clouds, economics of the cloud, open challenges.			
MODULE – 3			10 Hrs
Cloud platforms in industry: Amazon Web Services, Google AppEngine, Microsoft Azure. Advanced topics in cloud computing: Energy efficiency in clouds, Market based management of clouds, federated clouds/inter clouds, Third party cloud services.			
MODULE – 4			10 Hrs
Infrastructure security, IAM: Infrastructure security: network level, host level, application level, Identity and Access management: trust boundaries and IAM, why IAM? IAM challenges, IAM definitions, IAM architecture and practices, getting ready for cloud, IAM standards and protocols for cloud services, IAM practices in the cloud authorization management. Security management in the cloud: security management standards, security management in the cloud, availability management, SaaS, PaaS. IaaS availability management, access control, security vulnerability, patch and configuration management. Privacy: What is privacy? What is data life cycle? What are the key privacy concerns in cloud? Who is responsible for protecting privacy?			
Text Books:			
1. Mastering Cloud Computing, McGraw Hill publication, Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi			
2. Cloud security and privacy an enterprise perspective on risks and compliances, 2013, Tin Mather, Subra kumar swamy, shahed Latif			
Reference Books:			
1. Cloud Computing: Theory and Practice, Dan C Marinescu, first edition, MK publishers Nalin K Sharad, Multimedia information Networking, PHI, 2012.			
2. Cloud Computing- A practical approach, McGraw Hill publication, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter			

MOOCs:

1. <https://www.youtube.com/watch?v=Eg4AAGCE7X4>
2. <https://www.coursera.org/learn/cloud-computing>
3. <https://www.edx.org/course/introduction-cloud-computing-microsoft-cloud200x>

Activity:

Students are required to demonstrate the usage of various cloud deployment models.

Course Title	INTRODUCTION TO JAVA PROGRAMMING		
Course Code	21OECS62	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective:			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Summarize the strengths and weaknesses of Java programming and the basic concepts of object-oriented programming.	PO1,PO2	-
2.	Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages	PO1, PO2, PO3	-
3.	Apply the concepts of String Handling and Exception handling to develop efficient and error free codes.	PO1, PO2, PO3	-
Course Contents:			
MODULE – 1			10 Hrs
Basic concepts of Java : The History and Evolution of java: OOP Concepts, History of java, The java Buzz words, The Evolution of java, Lexical issues. Data types, variables: Data types, Variables, The Scope and Life time of variables, Operators, Expressions, Control statements, Type conversion and casting, Command Line Arguments.			
MODULE – 2			10 Hrs
Arrays: Declaration, Initialization and accessing values, One-Dimensional Arrays, Multi-dimensional arrays, Alternative Array Declaration Syntax, var-arg methods. Strings: Explore String class, StringBuffer and StringBuilder classes.			
MODULE – 3			10 Hrs
Class fundamentals. Declaration objects, Assigning object reference variables, Introducing Methods, Constructors, “this” keyword, Garbage collection. Inheritance basics, Using Super keyword, Types of inheritance, Benefits, Member access rules, Constructor and calling sequence, Using abstract Classes, Using final keyword. Method overriding and overloading.			
MODULE – 4			10 Hrs
Defining an interface, Implementing interface, Accessing interface properties. Defining Package, finding packages and class path, accessing Protection. Exception handling Fundamentals, exception types, Built-in Exceptions, Using try-catch-finally throw- throws Keywords, creating your own Exception subclasses.			
Text Books:			
1. Herbert Schildt, “Java The complete reference”, 9 th edition, McGraw Hill Education(India) Pvt. Ltd. 2. Ivor Horton, Beginning Java 2, JDK 5th Edition, Wiley dreamtech.			
Reference Books:			
1. An introduction to java programming and object oriented application development, R AJohson-Thomson. 2. Introduction to Java programming-comprehensive, Y. Daniel Liang, Tenth Edition, Pearson ltd 2015. 3. E Balagurusamy, Programming With Java : A Primer 5th Edition Tata McGraw Hill.			

Course Title	ANALYTICAL ABILITY AND SOFT SKILLS		
Course Code	21ASK	L-T-P	(0-2-0)1
Exam	1	Hours/Week	2
SEE	50 Marks	Total Hours	28
This course will be conducted at the end of fifth semester for two weeks by TAP department.			
Course Objective: To Enhance problem solving skills and communication skills			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply methods to solve numerical and reasoning problems	2,3	-
2	Lead a team in corporate offices	8,9	-
3	Communicate effectively in professional ambience	10	-
MODULE – 1			
Hard Skills: Speed/Distance, Probability, Permutations/Combinations, Profit/Loss, Simple Interest/Compound Interest, Number theories, Number/Letter series, Coding/Decoding, Blood relations, Directions, Clock, Calendar. Logical reasoning problems			
MODULE – 2			
Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills			
MODULE -3			
Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language.			
MODULE -4			
Activities: GD, JAM, Mock Interview, Pick and speak, Presentation			

Course Title	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS		
Course Code	21CIP	L-T-P-C	(0-2(A)-0)0
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Contents:			
Preamble to the constitution of India - Evolution of constitutional Law Scope and extent of fundamental rights under part III - Details of Exercise of rights, Limitations and Important Cases.			
			4 Hrs
Relevance of Directive Principles of State Policy under Part IV, Significance of Fundamental Duties under Part IV a.			
			4 Hrs
Union Executive President, Vice-President, Prime Minister, Council of Ministers, Parliament and Supreme Court of India.			
			3 Hrs
State Executive, Governor, Chief Minister, Council of Ministers, Legislature and High Courts.			
			4 Hrs
Constitutional provisions for scheduled castes and tribes, women and children and backward classes, Emergency provisions.			
			4 Hrs
Electoral process, amendment procedure, 42 nd , 44 th , 74 th , 76 th , 86 th and 91 st constitutional amendments.			
			3 Hrs
Honesty, integrity and reliability, risks, safety and liability in engineering.			
			3 Hrs
Professional Ethics: Scope and aims of engineering ethics, responsibility of engineers, impediments to responsibility.			
			3 Hrs
Text Books:			
1. Durga Das Basu : Introduction to the Constitution of India (Students Edn.), PH -EEE, 19 th / 20 th Edition., 2001 2. Charles E Haries, Michael S Pritchard and Michael J Robins, Engineering Ethics, Thompson Asia, 2003-08-05			
Reference Books:			
1. M V Pylee : An Introduction to Constitution of India, Vikas Publishing 2. M Govindarajan, S Natarajan, V S Senthilkumar : Engineering Ethics, Prentice - Hall of India, New Delhi, 2004			