

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)



Autonomous Programmes
Bachelor of Engineering

DEPARTMENT OF
INFORMATION SCIENCE AND ENGINEERING

SYLLABUS

V & VI Semester (2021 Admitted Batch)

(3rd Year)

Academic Year 2023-24

VISION

The department will be a premier centre focusing on knowledge dissemination and generation to address the emerging needs of information technology in diverse fields.

MISSION

1. To make students competent to contribute towards the development of IT field
2. Promote learning and practice of latest tools and technologies among students and prepare them for diverse career options
3. Collaborate with industry and institutes of higher learning for Research and Development, innovations and continuing education
4. Developing capacity of teachers in terms of their teaching and research abilities
5. Develop software applications to solve engineering and societal problems

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates will:

PEO1: be successful professionals in IT industry with good design, coding and testing skills, capable of assimilating new information and solve new problems

PEO2: communicate proficiently and collaborate successfully with peers, colleagues and organizations

PEO3: be ethical and responsible members of the computing profession and society

PEO4: acquire necessary skills for research, higher studies, entrepreneurship and continued learning to adopt and create new applications

PROGRAM OUTCOMES (POs)

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 Information Science & Engineering will be able to:

1. Design and Develop efficient information systems for organizational needs.
2. Ability to adopt software engineering principles and work with various standards of Computing Systems.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
THREE CIE's conducted for a total of 40 marks	40
Activities as decided by course faculty	10
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course coordinator	20
SEE	50
Total	100

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20
SEE	50	20

Scheme & Syllabus for III Year
B. E. Information Science and Engineering
Academic Year 2023-24

FIFTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P (Hours)	Credit	Contact Hours
PCC	21IS501	Software Engineering	3-0-0	3	3
PCC	21IS502	Theoretical Foundations of Computation	2-1-0	3	4
HSMC	21IS503	Management Information Systems	3-0-0	3	3
PCC	21IS504	Database Management Systems	3-0-2	4	5
PCC	21IS505	Data Communications	3-0-0	3	3
PEC	21IS5XX	ELE-1	3-0-0	3	3
PR	21IS507	Mini Project-1 (Database and Java Application)	0-0-2	1	2
PI	21INT2	Summer Internship -II	0-0-4	3	-
UHV	21SCR	Social Connect & Responsibility	0-2-0	1	2
HSMC	21EVS	Environmental Studies (Mandate non credit course)	0-1(A)-0	AUDIT	2
Total				24	25

ELECTIVE 1		
Data Storage & Analytics	21IS511-Data Warehousing and Mining	
Software Application Development	21IS512- Python Programming	21IS513-4-C# & .Net
Networking	21IS514- IOT	
Image Processing	21IS515- Computer Graphics & Visualization	

SIXTH SEMESTER					
Course Category	Course Code	Course Title	L-T-P (Hours)	Credits	Contact Hours
PCC	21IS601	Computer Networks	3-0-2	4	5
PCC	21IS602	Artificial Intelligence	4-0-0	4	4
HSMC	21IS603	Management, Entrepreneurship and IPR	3-0-0	3	3
PR	21IS605	Mini Project – 2 (Web Application Development)	0-0-2	1	2
PEC	21IS62X	Elective - II	3-0-0	3	3
OEC	21OEXX	Open Elective-1	3-0-0	3	3
AEC	21ASK	Analytical ability & Soft Skills	0-2-0	1	2
HSMC	21CIP	Constitution of India and Professional Ethics (Mandate Non Credit course)	2-0(A)-0	AUDIT	2
Total				19	24
Elective - II					
Data Storage & Analytics	21IS621 - Big Data Technologies				
Software Application Development	21IS622 - Parallel Computing				
Networking	21IS623 -Multimedia Computing	21IS624- Network Management			
Image Processing	21IS625- Digital Image Processing				

Course Title	SOFTWARE ENGINEERING		
Course Code	21IS501	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Use Software Engineering Principles for Application development			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyze a system for identifying the software requirements	2	2
2	Apply software process activities during system design	3	2
3	Apply different approaches of verifying and validating a software product.	1	2
4	Apply various project management activities	3	2
MODULE – 1			10 Hrs.
<p>Introduction: Professional Software Development, Software Engineering Ethics. Case studies: An insulin pump control system, Software Processes: Software Processes models, Process activities, coping with change, The Rational Unified Process. Agile Software Development: Agile Methods, Plan-driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods.</p> <p>Self Study: Case Studies- A patient information system for mental health care, A wilderness weather station</p>			
MODULE – 2			10 Hrs.
<p>Requirements Engineering: Functional and non-functional requirements. The software Requirements Document. Requirements Specification, Requirements Engineering Processes. Requirements Elicitation and Analysis. Requirements validation. Requirements Management. System Models: Context models. Interaction models. Structural models. Behavioural models. Model-driven engineering.</p> <p>Self Study: Behavioural models</p>			
MODULE -3			10 Hrs.
<p>Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development. Software Testing: Development testing, Test-driven development, Release testing, User testing. Software Evolution: Evolution processes, Program evolution dynamics. Software maintenance, Legacy system management</p> <p>Self Study: Designing UML diagrams</p>			
MODULE -4			10 Hrs.
<p>Software Project Management: Software Project Management Complexities, Responsibilities of a software project Manager, Project Planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures, Staffing, Risk Management</p> <p>Self Study: COCOMO, ISO9000, SEI Capability Maturity Model, Other Important Quality Standards, Six Sigma.</p>			
Text Books:			
1. Ian Sommerville, “Software Engineering”, 9th Edition, Person Education, 2014.			

Course Title		THEORETICAL FOUNDATIONS OF COMPUTATION		
Course Code	21IS502	(L-T-P)C	(2-1-0) 3	
Exam	3 Hrs	Hours/Week	4	
SEE	50 Marks	Total Hours	40	
#	Course Outcomes	Mapping to PO's	Mapping to PSO's	
1.	Understand the fundamental concepts of formal languages and automata theory.	1	-	
2.	Design DFAs, NFAs, and perform conversions among them.	3	-	
3.	Design regular expressions, context free grammars, Push Down Automata and Turing machines for different levels of formal languages.	3	-	
4.	Construct and simulate different kinds of automata using simulation tool .	5	-	
MODULE – 1				10 Hrs.
Introduction to Finite Automata: The Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Epsilon-Transitions, Equivalence of NFA and DFA.				
Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions				
MODULE – 2				10 Hrs.
Regular Expressions and Languages (Contd.): Pumping lemma for regular languages, Applications of Regular Expressions, Equivalence and Minimization of Automata.				
Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context Free Grammars, Ambiguity in Grammars.				
MODULE -3				10 Hrs.
Pushdown Automata: Introduction and construction of Pushdown Automata, Acceptance by final state and empty stack , Equivalence of PDA's and CFG's				
Turing Machines: Introduction to Turing Machine, Construction of Turing Machine.				
MODULE -4				10 Hrs.
Turing Machines (contd.): Programming Techniques for Turing Machines, Restricted Turing machines, Turing Machines and Computers, The Universal Turing Machine, Introduction to undecidable problems, Post's Correspondence Problem.				
Text Books:				
1. J.P.Hopcroft, Rajeev Motwani, J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 3rd Edition, 2007				
MOOC Course:				
1. Theory of Computation https://onlinecourses.nptel.ac.in/noc22_cs63				

Course Title	MANAGEMENT INFORMATION SYSTEMS		
Course Code	21IS503	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
<p>Course Objective: Students will be able to develop Information System solutions like ERP, CRM, and managerial issues relating to information systems.</p> <p>Course outcomes: At the end of course, student will be able to:</p>			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explain basic principles and working of information technology and the role of information systems in business processes	1	2
2.	Articulate the importance of customer relationship management, Enterprise resource planning and E-commerce.	2	2
3.	Apply the principles of information systems to a given business Scenario.	6	2
4.	Apply principles of IT in business administration.	8,9	2
MODULE-1			10 Hrs.
<p>Foundations of IS in Business: Information Systems in Business: Introduction, The Real World of Information Systems, The Fundamental Role of IS in Business, Types of IS, System Concepts: A Foundation, Components of an Information System, Information System Resources.</p> <p>Case studies :business intelligence, innovating with IT, business success, IT processes, spark batteries</p> <p>Competing with IT: Fundamentals of Strategic Advantages: Strategic IT, Competitive Strategy Concepts, The Competitive Advantage of IT, The Value Chain and Strategic IS, Reengineering Business Processes: The Role of IT, Creating a Virtual Company, Building a Knowledge-Creating Company.</p> <p>Case studies: IT risks and value, business on smart phones, trading securities, reinventing IT, automotives.</p>			
MODULE-2			10 Hrs.
<p>Electronic Business Systems: Enterprise Business Systems: Introduction, Cross-functional Enterprise Applications, Enterprise Application Integration, Transaction Processing Systems, Enterprise Collaboration Systems, Functional Business Systems: Introduction, Marketing Systems, Manufacturing Systems.</p> <p>Case studies: enterprise architects, nationwide insurance, Cisco systems ,strategic IT,dishtee.com</p> <p>Enterprise Business Systems: Customer Relationship Management: Introduction, What is CRM? The Three Phases of CRM, Benefits and Challenges of CRM, Trends in CRM, Enterprise Resource Planning: Introduction, What is ERP? Benefits and Challenges of ERP, Trends in ERP.</p> <p>Case studies: DirecTV, Kennametal, supply chains, Berlin packaging, relationship with dealers.</p>			
MODULE-3			10 Hrs.
<p>Electronic Commerce Systems: Electronic Commerce Fundamentals: Introduction, The Scope of Ecommerce, Essential E-Commerce Processes, Electronic Payment Processes, E-Commerce</p>			

Applications

and Issues: E-commerce Application Trends, Business-to- Consumer e-Commerce.

Case studies : Star bucks, LinkedIn, Entellium, Royal bank, egurucool.com

Decision Support Systems: Decision Support in Business: Introduction, Decision Support Systems (DSS),Management Information Systems, On-line Analytical Processing, Executive Information Systems,

Knowledge Management Systems, Business and Artificial Intelligence (AI), Expert Systems.

Case studies: Valero energy, virtual stores, Goodyear, Hillman group, Indian distributors.

MODULE-4

10 Hrs

Security and Ethical Challenges: Security, Ethical and Societal Challenges of IT: Introduction, Ethical Responsibility of Business Professionals, Computer Crime, Privacy Issues, Health Issues, Security Management of IT: Introduction, Tools of Security Management, Internetworked Security Defences.

Case studies: texashealth, Wyoming medical centre, challenges in IT, phishing.

Enterprise and Global Management of IT: Managing IT: Business and IT, Managing IT, Business/ IT Planning, Managing the IS Function, Managing Global IT: The International Dimension, Global Business/ IT Applications, GlobalIT Platforms, Global Data Access Issues, Global Systems Development

Case studies: reinventing IT at BP, Cadbury, Toyota, unified global operations, RFID implementation

Text Books:

1. James A. O’ Brien, George M. Marakas, “Management Information Systems”, 10th Edition, TataMcGraw Hill, 2018.Chapters: 1, 2, 7, 8, 9, 10, 13 and 14

Reference Books:

1. Kenneth C. Laudon and Jane P. Laudon, “Management Information System - Managing the Digital Firm” 9th Edition, Pearson Education, 2020
2. W.S. Jawadekar, “Management Information Systems”, Tata McGraw Hill 2021

MOOC: https://onlinecourses.nptel.ac.in/noc20_mg60/preview

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PSO1	PSO2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	3													3
CO2		3												3
CO3						3								3
CO4								3	3					3

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	21IS504	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50
Course Objective: Students will be able to develop database applications.			
Course Outcomes: At the end of the course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the concepts of Database Management Systems and its applications.	1	1
2	Design ER diagram for real world applications and develop SQL queries.	3	1
3	Apply normalizations for relation scheme.	2	1
4	Describe the issues in transaction management.	1	1
MODULE-1			10 Hrs
<p>Introduction: Introduction, an example, Characteristics of Database approach, Actors on the Screen, Workers Behind the Scene, Advantages of Using DBMS Approach. Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.</p> <p>Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two.</p> <p>Self Study: A brief History of Database Applications</p>			
MODULE-2			10 Hrs
<p>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 and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping.</p> <p>SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL.</p> <p>Self Study: SQL Data Types , Examples on SQL Queries</p>			
MODULE-3			10 Hrs
<p>SQL (contd.): More Complex SQL Queries, Insert Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Schema Change Statements in SQL.</p> <p>Self Study: Approaches to Database Programming, Impedance Mismatch, Stored procedure</p> <p>Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.</p>			
MODULE-4			10 Hrs

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock - Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery. Crash Recovery: Introduction to ARIES.

NoSQL: An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types, Advantages and Drawbacks of NoSQL,.

Practical Component:

Perform the following programs using MySQL.

1. Consider the following schema:

EMPLOYEE (Ename, Ssn, Bdate, Sex, Address, salary, Mgrssn, Dno)

DEPARTMENT (Dname, Dnumber, Mgrssn, Mgr_start_date)

PROJECT (Pname, Pnumber, Plocation, Dnum)

WORKS_ON (Essn, Pno, Hours)

DEPENDENT(Essn, Dependent_name, Sex)

Create above tables by specifying primary key, foreign key and other suitable constraints.

Insert atleast 5 tuples to each created table.

- i. Retrieve the name and address of all employees who work for the "ISE" department.
- ii. For each employee, retrieve the employee's name and the name of his or her immediate supervisor
- iii. Find the sum of all salaries of all employees
- iv. For each department, retrieve the department number, the number of employees in the department and their average salary.

2. Consider the following relation schema:

SAILORS (Sid: integer, Sname: string, Rating: integer, Age: real)

BOATS (Bid: integer, Bname: string, Color: string)

RESERVES (sid: integer, Bid: integer, Day:date)

Create above tables by specifying primary key, foreign key and other suitable constraints.

Insert atleast 5 tuples to each created table.

Design a database to the satisfy the above requirements and answer following queries

- i. Find all sailors with a rating above 7
- ii. Find the names of sailors who have reserved boat number 103
- iii. Find the names of sailors who have reserved a red boat
- iv. Find the names of sailors who have reserved a red or a green boat

3. Consider the following relation schema:

STUDENT (Snum: integer, Sname: string, Major: string, Level: string, Age: integer)

CLASS (Cname: string, Meets at: string, Room: string, Fid: integer)

ENROLLED (Snum: integer, Cname: string)

FACULTY (Fid: integer, Fname: string, Deptid: integer)

The meaning of these relations is straightforward; for example, enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)

Write the following queries in SQL. No duplicates should be printed in any of the answers.

- i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
- ii. Find the names of all classes that either meet in room R128 or have five or more Students

enrolled.

iii. Find the names of all students who are enrolled in two classes that meet at the same time.

iv. Find the names of faculty members who teach in every room in which some class is taught.

4. Consider the relation schema for book dealer database:

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)

Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.

i. 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.

ii. Find the author of the book which has maximum sales.

iii. Demonstrate how you increase the price of books published by a specific publisher by 10%

iv. List any department that has all its adopted books published by a specific publisher

5. Consider the schema for Movie Database:

ACTOR (Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone)

MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)

MOVIE_CAST (Act_id, Mov_id, Role)

RATING (Mov_id, Rev_Stars)

Write SQL queries to

Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.

1. List the titles of all movies directed by 'Hitchcock'.

2. Find the movie names where one or more actors acted in two or more movies.

3. List all actors who acted in a movie before 2000 and also in a movie after 2015.

4. Update rating of all movies directed by 'Steven Spielberg' to 5.

6. Consider the following database for a banking enterprise

BRANCH (branch-name: String, branch-city: String, assets: real)

ACCOUNTS (accno: int, branch-name: String, balance: real)

DEPOSITOR (customer-name: String, customer-street: String, customer-city: String)

LOAN (loan-number: int, branch-name: String, amount: real)

BORROWER (customer-name: String, loan-number: int)

Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.

1. Find all the customers who have at least two accounts at the Main branch.

2. Find all the customers who have an account at all the branches located in a specific city.

Demonstrate how you delete all account tuples at every branch located in a specific city.

Text Books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", 7th Edition, Addison-Wesley, 2015.

2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition,

Course Title	DATA COMMUNICATIONS		
Course Code	21IS505	(L-T-P)C	(3-0-0)3
Exam	3Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To gain basic knowledge of data communication and computer networks.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the layered organization of computer networks, representation and conversions of data and signals.	1	-
2	Describe the working of various Media, SONET and ATM.	1	-
3	Apply Line coding, Multiplexing and Error handling techniques.	3	-
4	Analyze the need for different protocols in data link layer.	2	-

MODULE – 1

10 Hrs.

Introduction: Data Communications, Networks, Network Types, Network Models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model. Introduction to Physical Layer: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission: Digital-to-Digital Conversion - Line Coding, Line Coding Schemes.

MODULE – 2

10 Hrs.

Digital Transmission (Contd.): Block Coding and Scrambling, Analog-to-Digital Conversion, Transmission Modes, Analog Transmission: Digital-to-Analog Conversion, Analog-to-Analog Conversion. Transmission Media: Introduction, Guided Media, Unguided Media: Wireless

MODULE -3

10 Hrs.

Switching: Introduction, Circuit-Switched Networks, Packet Switching. Introduction to Data-Link Layer: Introduction, Link-Layer Addressing . Error Detection and Correction: Introduction, Block Coding, Cyclic Codes, Checksum, Forward Error Correction.

MODULE -4

10 Hrs.

Data Link Control: DLC Services, Data-Link Layer Protocols, HDLC. Other Wired Networks: Cable Networks, SONET, Architecture, layers ,ATM.

Tutorial:

Sl. No.	List of Practicals
1	Study of Network Components
2	Study of Analog and Digital Signals.
3	Study of Network Topologies.
4	To connect two pc's using peer to peer communication.
5	To study Error Detection & Corrections methods.
6	To study the different line coding schemes.

Text Books:

1. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, 2013.

(1.1-1.3,2.1-2.3), (3.1-3.6,4.1,4.1.1,4.1.2), .(4.1.3,4.1.4,4.2,4.3,5.1,5.2), (7.1-7.3), (8.1-

Course Title	MINI PROJECT – 1 (DATABASE AND JAVA APPLICATION)		
Course Code	21IS507	L-T-P	(0-0-2) 2
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	26

Students should form batches of 3-4 members and develop database applications using Oracle/MySQL/Microsoft SQL as backend and Java as front end.

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a real life/engineering problem, and conduct investigation to address the problem	1,2	1
2.	Apply software engineering principles in planning & designing the solution to the chosen problem	1,2,3	2
3.	Implement & test the design with appropriate techniques, resources and contemporary tools	3,5	1
4.	Communicate effectively with team members and mentors, make presentations and prepare technical document	9,10,11,12	1
5.	Use ethical practices in all endeavours	8	1

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (5 Marks)	Literature Survey not pertaining to the title of the project (2 M)	Incomplete literature survey and improper problem definition (3-4 M)	Extensive literature survey with clear state of the art problem definition (5M)
Effective Formulation of Design strategies (10 Marks)	Has no coherent strategies for problem solving (2 - 4 M)	Has some strategies for problem -solving, but does not apply them consistently (5-7 M)	Formulates strategies for solving problems (8-10 M)
Implementation Techniques (10 Marks)	No proper technique for implementation (2 - 4 M)	Has some techniques but does not apply them consistently (5-7 M)	Uses well defined implementation techniques (8-10 M)
Verification of the results (5 Marks)	No attempt at checking the incorrect solution. (2 M)	The solution is correct, but not visualized efficiently (3-4 M)	The solution is correct and visualized in an efficient way (5M)
Presentation/ communication (10 Marks)	Disorganized and ineffective presentation (2 - 4 M)	Organized, but ineffective presentation (5-7 M)	Effective organized presentation (8-10 M)
Report Preparation	Disorganized and	Organized but not	Effectively organized

(10 Marks)	contents not sufficient (2 - 4 M)	good content wise (5-7 M)	and well framed contents (8-10 M)
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The mini project work is to be carried out in three phases:

- **Project Phase I** - Students in consultation with the guides shall carry out literature survey to finalize the topic of the project. Evaluation of the project and its feasibility is done at the end of two weeks.
- **Project Phase II** - Students are expected to present the system analysis, Requirements Specification, design carried out/ algorithms developed and intermediate results at the end of six weeks.
- **Project Phase III** - Final internal evaluation shall be taken up during this phase. This includes presentation, project demonstration and report
- **The continuous evaluation of the project phases** – I, II, and III shall be carried out by the committee consisting of Head of the department, Guide and other faculty.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											3	
CO2	3	3	3											3
CO3			3	3									3	
CO4									3	3	3	3	3	
CO5								3					3	

SUMMER INTERNSHIP 2 (21INT2)

Guidelines for conducting Summer Internship –II on Innovation/ Entrepreneurship/ Societal Internship/ Skill Enhancement for 2021 admitted NEP Batch

1. A minimum of 3 Credit of internship after II year may be counted towards B.E. Degree Program.
2. During IV semester to V Semester transition, four weeks internship is mandatory.
3. Internship report and certificate need to be submitted by the student to the concerned department for evaluation at the end of internship.
4. Internship evaluation will be done at the end of internship before the start of 5th Semester.

There are three options for carrying out the Summer internship II as shown below:

5. Option-1 Students are suggested to carry out internship on Innovation/ Entrepreneurship in industry.(Innovation refers to a new or improved product or process or a combination thereof that differs marginally or significantly from the unit's previous product & Entrepreneurship refers to setting up a new business or businesses, taking on financial risks in the hope of profit)
6. Option-2 If industry internships are not available students are encouraged to take up Societal Internship in any Reputed NGOs(Internship at villages, slums or urban areas , Swachh Bharat etc. can be under social internship. A detail report should be submitted by the candidate with appropriate documents supporting the work carried out. Certificate should be signed by gazetted officer)
7. Option-3 If students fail to get internship in Innovation/ Entrepreneurship and Societal Internship then the college shall advise those students to take Skill Enhancement courses offered by NPTEL.

Course Title	Social Connect & Responsibility		
Course Code	21SCR	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	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 neighbouring 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. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

Marks allotted for the diary are out of 50.

Planning and scheduling the social connect

Information/Data collected during the social connect

Analysis of the information/data and report writing

Course Title	Environmental Studies (Mandatory Audit Course)		
Course Code	21EVS	L-T-P	(2-0-0) 2
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	26
Course Outcomes: At the end of the course, student will be able to:			
#	Course Outcomes (CO)	Mapping to POs	
1.	Acquire an awareness of and sensitivity to the total environment and its allied problems.	7, 10	
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.	6,8	
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economical, societal and aesthetic factors.	6, 8, 9	
MODULE-1			4 Hrs
Environment: Definition, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.			
MODULE-2			8 Hrs
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.			
MODULE-3			7 Hrs
Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.			
MODULE-4			7 Hrs
Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection - Legal aspects. Water Act and Air Act.			
Text Books:			
1. Environmental Studies - Dr. D.L Manjunath, Pearson Education -2006			
2. Environmental Studies - Dr. S. M. Prakash - Elite Publishers - 2006			
Reference Books:			
1. Environmental Studies - Benny Joseph - Tata McGraw ill- 2005			
2. Principles of Environmental Science and Engineering P. Venugopala Rao, Prentice Hall of India.			
3. Environmental Science and Engineering - Meenakshi, Prentice Hall India.			

Courses for Elective Group - I

Course Title	DATA WAREHOUSING AND MINING		
Course Code	21IS511	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40
<p>Course Objective: Students will be able to select appropriate data mining techniques to extract useful patterns.</p> <p>Course outcomes: At the end of course, student will be able to:</p>			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Acquire the knowledge on data quality and data pre-processing	1	1
2	Explain the process of data mining , Classification and Association Analysis	2,3	-
3	Acquire the knowledge of Data Warehouse design , Modelling and usage	3	1
4	Carry out the cluster analysis and highlight the applications of data mining	2	-
MODULE – 1			10Hrs.
<p>Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined? What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. Getting to know your data: Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity.</p>			
MODULE – 2			10Hrs.
<p>Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing.</p>			
MODULE -3			10Hrs.
<p>Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest-neighbour Classifier. Mining frequent patterns Association and correlations: Basic Concepts and Methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.</p>			
MODULE -4			10Hrs.
<p>Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN. Data Mining Trends and research frontiers: Data Mining Applications, Data mining and society, Data mining trends.</p>			
Text Books:			

Course Title	C# AND .NET		
Course Code	21IS513	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to apply Object Oriented Programming concepts for designing Applications using language C# and IDE – Visual Studio.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop C# programs using Visual Studio IDE.	1,2	-
2	Apply Object Oriented Programming concepts in C# programming language	1,2	-
3	Interpret Interfaces and define custom interfaces for application.	1,2	-
4	Analyse a C# program for identifying bugs.	2	-
MODULE – 1			10Hrs.
Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, working with variables, operators, and expressions, writing methods, and applying scope, using decision statements, using compound assignment and iteration statements, Managing errors and exceptions.			
MODULE – 2			10Hrs.
Understanding the C# object model: Creating and Managing classes and objects, understanding values and references, creating value types with enumerations and structures, Using arrays.			
MODULE -3			10Hrs.
Understanding parameter arrays, working with inheritance, creating interfaces and defining abstract classes, Using garbage collection and resource management.			
MODULE -4			10Hrs.
Defining Extensible Types with C#: Implementing properties to access fields, introducing generics, Using collections, Operator overloading.			
Text Books:			
1. John Sharp, Microsoft Visual C# Step by Step, 8th Edition, PHI Learning Pvt. Ltd. 2016			
Reference Books:			
1. Tom Archer, Andrew Whitechapel, Inside C#, WP Publishers			
2. Herbert Schildt, The Complete Reference C# 3.0, Tata McGraw Hill Education Private Limited			
MOOC Course:			
1. https://www.coursera.org/learn/intro-to-dotnet-core			

Course Title	INTERNET OF THINGS		
Course Code	21IS514	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40hrs
Course Objective: Students will be able to develop IOT applications			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the fundamentals and applications of IoT, its Architecture, Design Principles and Standards	1	
2	Apply programming skills to design IoT applications	3	
3	Analyze IoT system management	2	2
4	Design and Implement applications of IoT and make presentation in team	5,10	2
MODULE – 1			10 Hrs.
<p>Introduction to Internet of Things: Definition and characteristics of IoT, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design, IoT functional blocks, IoT communication Models, IoT communication API's, IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems.</p> <p>IoT levels and deployment template Domain specific IoTs, - IoT levels, Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health &Lifestyle.</p>			
MODULE – 2			10 Hrs.
<p>IoT and M2M IoT System management with NETCONF-YANG Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPEER.</p> <p>IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring.</p>			
MODULE -3			10 Hrs.
<p>IoT Physical Devices and End points - What is an IoT device; Exemplary Device- Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices.</p> <p>IoT Physical Servers & Cloud Offerings: Designing a Restful Web API, Amazon Web Services for IoT, AmazonEC2, Amazon Auto Scaling, AmazonS3, Amazon RDS.</p>			
MODULE -4			10 Hrs.
<p>Case studies illustrating IoT Design: Introduction to IOT Design, Home Automation, Smart Lighting, Home Intrusion Detection, Cities, Smart Parking.</p> <p>Data Analytics for IOT- Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis.</p>			
Text Books:			
1. Internet of Things - A Hands on Approach, ArshdeepBahga and Vijay Madiseti Universities Press, 2015			

Reference Books:

1. 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.
2. Vijay Madiseti, ArshdeepBahga, Internet of Things: A Hands-On Approach Vijay Madiseti, 1st Edition ISBN-10: 0996025529, 2014

MOOC Course:

<https://nptel.ac.in/courses/108/108/108108098/>

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PSO1	PSO2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2			2											
CO3		3												2
CO4					3					3				3

Course Title	COMPUTER GRAPHICS AND VISUALIZATION		
Course Code	21IS515	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to develop interactive computer graphics applications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explain principles and techniques of computer graphics hardware and software	1	2
2.	Apply graphics algorithms and geometric transformations	2	-
3.	Explain 2D and 3D viewing, lighting and shading	1	-

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: Programmable Pipelines, Performance Characteristics. Graphics Programming: The Sierpinski Gasket, Programming Two-Dimensional Applications. The OpenGL API, Primitives and Attributes

MODULE – 2

10 Hrs.

The OpenGL API (contd.): 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, Picking, A Simple CAD Program.

MODULE -3

10 Hrs.

Geometric Objects and Transformations-1: Scalars, Points, and Vectors, Three-Dimensional Primitives, Coordinate Systems and Frames, Modeling a Colored Cube, Affine Transformations.

Geometric Objects and Transformations-2: Rotation, Translation and Scaling, Transformations in Homogeneous Coordinates, Concatenation of Transformations, OpenGL Transformation Matrices, Interfaces to Three-Dimensional Applications.

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, Interactive Mesh Displays.

Lighting and Shading: Light and Matter, Light Sources, The Phong Lighting Model, Computation of Vectors, Polygonal Shading, Approximation of a Sphere by Recursive Subdivisions, Light Sources in OpenGL, Specification of Materials in OpenGL.

Text Books:

1. Edward Angel, "Interactive Computer Graphics", A Top-Down Approach with OpenGL, 5th Edition, Addison-Wesley, 2008.

Reference Books:

1. F.S. Hill Jr., "Computer Graphics Using OpenGL", 2nd Edition, Pearson Education, 2001.
2. Donald Hearn and Pauline Baker, "Computer Graphics - OpenGL Version", 2nd Edition, Pearson

Course Title	Computer Networks		
Course Code	21IS601	(L-T-P)C	(3-0-2)4
Exam	3Hrs	Hours/Week	5
SEE	50 Marks	Total Hours	50(36L+14P)

Course Objective: Develop Knowledge of different computer networks from design and performance perspective

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the functions of Ethernet, Virtual LANs, Connecting devices and different protocols at the Network, Transport and Application Layers	1	-
2	Analyze different Protocols at MAC sub layer, Network and Transport Layers	2	-
3	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem.	3	-
4	Conduct various experiments on network designs using different tools and debug the same.	5	-

MODULE – 1

9 Hrs.

Media Access Control: Random access,ALOHA,CSMA,CSMA/CD,CSMA/CA Controlled Access, Channelization. Wired LANs: Ethernet: Ethernet Protocol.

Ethernet (Contd): Standard Ethernet., Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet Connecting Devices.

MODULE – 2

9 Hrs.

Introduction to Network Layer: Network Layer Services,Packetizing,Routing and Fowarding, Packet Switching, Network Layer Performance, IPV4 Addresses – Address Space, Classful Addressing, Classless Addressing

Network Layer Protocols: Internet Protocol (IP), ICMPv4, Unicast Routing: Introduction. Routing Algorithms,Distance vector routing,link state routing.

MODULE -3

9 Hrs.

Multicast Routing: Introduction, Multicasting Basics. Intradomain Multicasting Protocols – Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF). Intradomain Multicasting Protocols ,Protocol Independent Multicast (PIM), Interdomain Multicasting Protocols

Next Generation IP: IPV6 Addressing, The IPv6 protocol, Transition from IPv4 to IPv6, Transport Layer: Introduction to Transport-Layer Transport Layer Protocols - Simple Protocol, Stop-and- Wait Protocol.

MODULE -4

9 Hrs.

Practical Component

Perform the following programs using C/C++ and any Network Simulator Tool

1. Write and execute a program for distance vector algorithm to find the suitable path for transmission between sender and receiver.

Course Title	Artificial Intelligence		
Course Code	21IS602	L-T-P	(4-0-0) 4
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40 P

Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge based systems

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

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Elucidate different types of intelligent agents, search strategies, logic and examples of learning.	1	1
2.	Analyze the different agents, search strategies and first-order logic.	2	1
3.	Develop a solution for the given problem using different intelligent agents.	3, 5,9, 10, 12	1

MODULE-1

14 Hrs.

Introduction: What is AI? **Intelligent Agents:** Agents and environment; Good behaviour: 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, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search.

MODULE-2

12 Hrs.

Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded heuristic search; **Local Search Algorithms and Optimization Problems:** Hill-climbing search, Simulated annealing.

Local beam search, Genetic algorithms; **On-line search agents and unknown Environments:** Online search problems, Online search agents, online local search, learning in online search.

MODULE-3

12 Hrs.

Logical Agents: Knowledge-based agents; The Wumpus world, Logic, propositional logic, Propositional Theorem proving

First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic.

MODULE-4

12 Hrs.

Inference in first-order logic: propositional versus first-order inference, uniform and lifting, forward chaining, backward chaining, resolution

Learning from Examples: Forms of Learning; supervised learning; Learning decision trees, Evaluating and choosing the best hypothesis, The theory of Learning.

Text Books:

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

MOOC

1. <https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x>
2. <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271>
3. <https://www.class-central.com/subject/ai>

Course Title	Management, Entrepreneurship and IPR		
Course Code	21IS603	L-T-P	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	40

Course Objective: Student will Analyze various concepts of different styles of motivation, company leadership, power and authority.

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Describe the functions of management activities such as planning, organization and staffing, directing and controlling.	1,2,11	-
2	Explain the importance of entrepreneurship and entrepreneurial Process.	2, 11	-
3	Prepare a project report for a given business requirement.	10	-

MODULE-1

10 Hrs.

Management: Introduction - Meaning - Nature and Functions of Management, Importance & Definition of Management, Management Functions, Roles of a Manager, Levels of Management, Managerial Skills, Management & Administration, Management as a Science, Actor Profession–Development of Management Thought-Early Management Approaches, Modern Management Approaches
Planning: Nature, Importance and Forms of Planning, Types of Plans, Steps in Planning, Limitations of Planning, Making Planning Effective–Decision Making–Meaning, Types of Decisions, Steps in Decision Making, Common Difficulties in Decision – Making.

MODULE-2

10 Hrs

Organization and Staffing: Meaning and Process of Organizing - Principles of Organizing - Types of Organization - Departmentalization - Committees. Centralization Vs Decentralization of Authority and Responsibility, Nature and Importance of Staffing - Process of Selection & Recruitment (in brief).
Directing Controlling: Requirements of Effective Direction, Motivation Theories, Communication –Importance, Purpose- Leadership Styles, Meaning and Steps in Controlling, Need for Control, Essentials of Effective Control System.

MODULE-3

10 Hrs.

Entrepreneur: Meaning of Entrepreneur: Importance of an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Concept of Entrepreneur, Concept of Entrepreneurship – Evolution
Entrepreneurship Development of Entrepreneurship, Stages in Entrepreneurial Process, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Entrepreneurship-Its Barriers

Institutional support: Introduction, Institutional Finance, Different Schemes–SSIDC, DIC.

MODULE-4

10 Hrs.

Patents: Introduction, Origin and meaning of the term patent, Objective of a patent law, the legislative provisions regulating patents, principles underlying the patent law in India, patentable invention. Procedure for obtaining patent: Submission of application, Filing provisional and complete specification, Examination of the application. Copy Right: Meaning and characteristics of copy right, Indian copy right law, requirement of copy right, Illustrations copy right in literary work, Musical work, Artistic work, work of architecture, Cinematograph film, sound recording. Author and Ownership of copy right: Ownership of copy right, Contract of service

TextBooks:

Principles of Management – P. C. Tripathi, P.N. Reddy – Tata McGraw Hill

Dynamics of Entrepreneurial Development & Management-Vasant Desai, Himalaya Publishing House

Entrepreneurship Development – Poornima. M. Charantimath, Small Business Enterprises –Pearson Education

Reference Books:

1. Management Fundamentals - Concepts, Application, Skill Development – RobersLusier, Thomson.
2. Entrepreneurship Development - S. S. Khanka, S. Chand & Co. New Delhi.

MOOC:

1. Entrepreneurship <https://nptel.ac.in/courses/110/106/110106141/>

Course Articulation Matrix

Course Outcomes		Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3	3									3				
CO2		2									2				
CO3										2					

Course Title	MINI PROJECT - 2 (WEB APPLICATION DEVELOPMENT)		
Course Code	21IS605	L-T-P	(0-0-2)2
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	26

Course Objective: Develop web-based applications using XHTML, Javascript, PHP, MYSQL and other latest tools.

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

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a real life/engineering problem, and conduct investigation to address the problem	1,2	1
2.	Apply software engineering principles in planning & designing the solution to the chosen problem	1,2,3	2
3.	Implement the design and test with appropriate techniques, resources and contemporary tools	3,5	1
4.	Communicate effectively with team members and mentors, make presentations and prepare technical document	9,10,11,12	1
5.	Use ethical practices in all endeavors	8	1

Rubrics:

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (5 Marks)	Literature Survey not pertaining to the title of the project (2 M)	Incomplete literature survey and improper problem definition (3-4 M)	Extensive literature survey with clear state of the art problem definition (5M)
Effective Formulation of Design strategies (10 Marks)	Has no coherent strategies for problem solving (2 - 4 M)	Has some strategies for problem -solving, but does not apply them consistently (5-7 M)	Formulates strategies for solving problems (8-10 M)
Implementation Techniques (10 Marks)	No proper technique for implementation (2 - 4 M)	Has some techniques but does not apply them consistently (5-7 M)	Uses well defined implementation techniques (8-10 M)
Verification of the results (5 Marks)	No attempt at checking the incorrect solution. (2 M)	The solution is correct, but not visualized efficiently	The solution is correct and visualized in an efficient way

		(3-4 M)	(5M)
Presentation/ communication (10 Marks)	Disorganized and ineffective presentation (2 - 4 M)	Organized, but ineffective presentation(5-7 M)	Effective organized presentation (8-10 M)
Report Preparation (10 Marks)	Disorganized and contents not sufficient (2 - 4 M)	Organized but not good content wise (5-7 M)	Effectively organized and well framed contents (8-10 M)

Initially Students will be taught the basic concepts about XHTML, Javascript, PHP, MYSQL and following programming exercises are carried out to understand the concepts.

1. Develop and demonstrate a XHTML document that illustrates the use of external style sheet, ordered list, table, borders, padding, color, and the tag.
2. Develop and demonstrate, using Javascript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
3. Using Javascript script, develop a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
4. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Branch, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
5. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
6. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
7. Using PHP and MySQL, develop a program to accept book information viz. Accession Number, Title, Authors, Edition and Publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

After the completion of above exercises a mini project work is to be carried out in three phases:

- **Project Phase I (5 marks)**- Students in consultation with the guides shall carry out literature survey to finalize the topic of the project. Evaluation of the project and its feasibility is done at the end of two weeks.
- **Project Phase II(25 marks)** - Students are expected to present the system analysis, Requirements Specification, design carried out/ algorithms developed and intermediate results at the end of six weeks.
- **Project Phase III (20 marks)**- Final internal evaluation shall be taken up during this phase. This includes presentation, project demonstration and report

The continuous evaluation of the project phases – I, II, and III shall be carried out by the committee consisting of Head of the department, Guide and other faculty.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PSO1	PSO2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	3	3											3	
CO2	3	3	3											3
CO3			3		3								3	
CO4									3	3	3	3	3	
CO5									3				3	

COURSES FOR PROGRAM ELECTIVE II

Course Title	BIG DATA TECHNOLOGIES		
Course Code	21IS621	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Acquire the knowledge, skills and tools to manage big data.			
Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe big data concepts, database models and big data techniques	1	-
2.	Describe architectural elements of HDFS, Map Reduce, YARN, Spark and Storm	1	-
3.	Apply big data concepts and techniques to address issues in a given scenario	1	1
4.	Design Map reduce solution or Hbase query for a given problem	3	1
MODULE - 1			10 Hrs
<p>Introducing Hadoop and Seeing What It's Good for – Big Data and the Need for Hadoop, The Origin and Design of Hadoop, Examining the Various Hadoop Offerings. Use Cases for Big Data in Hadoop – The Keys to Successfully Adopting Hadoop, Log Data Analysis, Data Warehouse Modernization, Fraud detection, Risk modelling, Social Sentiment Analysis, Image Classification, Graph Analysis, To Infinity and Beyond.</p> <p>Storing Data in Hadoop: The Hadoop Distributed System – Data Storage in HDFS, Sketching Out the HDFS Architecture, HDFS Federation, HDFS High Availability.</p>			
MODULE - 2			10 Hrs
<p>Map Reduce Programming – Thinking in Parallel, Seeing the Importance of MapReduce, Doing Things in Parallel: Breaking Big Problems into Many Bite-Size Pieces, Writing MapReduce Applications, Getting Your Feet Wet: Writing a Simple MapReduce Application.</p> <p>Frameworks for Processing Data in Hadoop: YARN and MapReduce – Running Application Before Hadoop 2, Seeing a World Beyond MapReduce, Real-time and Streaming Applications.</p> <p>Statistical Analysis in Hadoop – Pumping Up Your Statistical Analysis, Machine Learning with Mahout, R on Hadoop.</p>			
MODULE - 3			10 Hrs
<p>Hadoop and the Data Warehouse: Friends or Foes? – Comparing and Contrasting Hadoop with Relational Databases, Modernizing the Warehouse with Hadoop.</p> <p>Extremely Big Tables: Storing Data in HBase – Say Hello to HBase, Understanding the HBase Data Model, Understanding the HBase Architecture, Taking HBase for a Test Run, Getting Things Done with HBase, HBase and the RDBMS world.</p>			
MODULE - 4			10 Hrs
<p>Introducing Spark: Spark's Background and History, Common Use Cases for Spark, Understanding How Spark Processes Information, How Spark Benefits the Entire Organization, Core Spark Technology</p>			

Course Title	Parallel Computing		
Course Code	21IS622	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective:

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe fundamentals of parallel computing	1	
2.	Analyse the performance and design the parallel platforms	2	2
3.	Develop parallel application using PThreads /OpenMP/MPI	3	2
4.	Analyse the given problem, identify the hotspot and parallelize the given application	2	

MODULE – 1

10 Hrs.

Introduction: Motivating Parallelism, Scope of Parallel Computing. Parallel Programming Platforms : Implicit Parallelism, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms, Interconnection Networks.

MODULE – 2

10 Hrs.

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models. Basic Communication Operations: One-to-All Broadcast, All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce, Scatter and Gather, Analytical Modelling: Sources of Overhead in Parallel Computing.

MODULE -3

10 Hrs.

Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, building blocks, MPI, Topologies and Embedding, Overlapping Communication with Computation, collective Communication and Computation Operations, Groups and Communicator.

MODULE -4

10 Hrs.

Programming Shared Address Space Platforms Thread Basics, WhyThreads? The POSIX Thread API, Creation & Termination, OpenMP: Specifying concurrent tasks, "for" directive, Assigning iterations to threads, "section" directive, merging directives, Nesting directives, Synchronization constructs in OpenMP, Data Handling in OpenMP, OpenMP library functions.

Text Books:

1. Anantha Grama, Anshul Gupta, George Karypis, Vipin Kumar, Introduction to Parallel Computing, Addison Wesley, 2003.

Reference Books:

3. Michael J. Quinn ,Parallel computing : Theory and Practice, McGraw-Hill, 2nd ed, 2002

MOOC Course:

2. <https://nptel.ac.in/courses/106102163>

Course Title	MULTIMEDIA COMPUTING		
Course Code	21IS623	(L-T-P)C	(3-0-0)3
Exam	3Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40
<p>Course Objective: To understand the principles of network management, different standards and protocols used in managing complex networks</p> <p>Course outcomes: At the end of course, student will be able to:</p>			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Acquire the knowledge about various multimedia systems and get familiarized with television systems and animations	1,2	-
2	Analysis on different file format standards	1,2	-
3	Analyze basics of computer-based animation and learn Learn various data compression standards	2	-
MODULE – 1			10 Hrs.
<p>Introduction, Media and Data Streams, Audio Technology: Media and Data Streams: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions, Key Properties of a Multimedia System : Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration, Characterizing Data Streams: Asynchronous Transmission Mode, Synchronous Transmission Mode, Isochronous Transmission Mode, Characterizing Continuous Media Data Streams. Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics, Audio Representation on Computers, Three Dimensional Sound Projection, Music and MIDI Standards, Speech Signals, Speech Output, Speech Input, Speech Transmission.</p> <p>Graphics and Images, Video Technology: Capturing Graphics and Images Computer Assisted Graphics and Image Processing, Reconstructing Images, Graphics and Image Output Options. Basics, Television Systems, Digitalization of Video Signals, Digital Television, Basic Concepts.</p>			
MODULE – 2			10 Hrs.
<p>Computer-Based Animation, Data Compression: Specification of Animations, Methods of Controlling Animation, Display of Animation, Transmission of Animation, Virtual Reality Modeling Language. Storage Space, Coding Requirements, Source, Entropy, and Hybrid Coding.</p> <p>Data Compression (Contd.): Basic Compression Techniques, JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode H.261 (Px64) and H.263:</p>			
MODULE -3			10 Hrs.
<p>Data Compression (Contd.): Image Preparation, Coding Algorithms, Data Stream, H.263+ and H.263L, MPEG: Video Encoding, Audio Coding, Data Stream, MPEG- 2, MPEG-4, MPEG- 7, Fractal Compression. Content Analysis: Simple Vs. Complex Features, Analysis of Individual Images, Analysis of Image Sequences.</p>			
MODULE -4			10 Hrs.
<p>Content Analysis (Contd.), Data and File Format Standards: Audio Analysis, Applications Rich-Text Format, TIFF File Format, Resource Interchange File Format (RIFF), MIDI File Format, JPEG DIB File Format for Still and Motion Images. Data and File Format Standards (Contd.),Multimedia Application</p>			

Course Title	NETWORK MANAGEMENT		
Course Code	21IS624	(L-T-P)C	(3-0-0)3
Exam	3Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To understand the principles of network management, different standards and protocols used in managing complex networks

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Acquire the knowledge about various network management standards, tools and the skill to use them in monitoring a network	1,5	-
2	Analyze the data provided by an NMS and take suitable actions	2	-
3	Evaluate various commercial network management systems and open network management systems.	3,4	-

MODULE – 1

10 Hrs.

Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IPBased Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management

MODULE – 2

10 Hrs.

Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

MODULE -3

10 Hrs.

SNMPv1 Network Management: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model – The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations, SNMP MIB Group, Functional Model SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMON1- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications.

Course Title	DIGITAL IMAGE PROCESSING		
Course Code	21IS625	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to develop image processing applications.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe the fundamental concepts and different steps of digital image processing.	1	-
2.	Apply the concept of filters for image enhancement in spatial and frequency domains.	2	-
3.	Apply different algorithms for image segmentation.	2	-
4.	Analyze different image compression techniques.	2	-

MODULE – 1

10 Hrs.

Introduction: What is Digital Image Processing, Examples of fields that use Digital Image Processing, Fundamentals steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals: Elements of Visual Perception, Image Sampling and Quantization, Basic relationships between pixels.

MODULE – 2

10 Hrs.

Intensity Transformations and Spatial Filtering: Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering. Filtering in the Frequency Domain: Background, Preliminary Concepts, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

MODULE -3

10 Hrs.

Image Compression: Fundamentals –Coding Redundancy, Spatial and Temporal Redundancy, Irrelevant Information, Fidelity Criteria, Image Compression Models. Some Basic Compression Methods - Huffman coding, Arithmetic Coding, Run-Length Coding, LZW coding, Bit-Plane Coding.

MODULE -4

10 Hrs.

Image Segmentation: Fundamentals, Point, Line, and Edge Detection, Thresholding- Foundation, Basic Global Thresholding, Optimum Global Thresholding Using Otsu's Method Image Segmentation Continued: Region-based segmentation, Segmentation by morphological watersheds, the use of motion in Segmentation.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods: "Digital Image Processing", 3rd Edition, Pearson Education, 2012.

Reference Books:

1. Anil K. Jain: "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd., 2011.
2. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.

COURSES FOR OPEN ELECTIVES OFFERED BY ISE DEPARTMENT

Course Title	Java Programming		
Course Code	21OEIS61	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective:

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Comprehend the fundamental concepts Object Oriented Programming	1	1
2.	Apply Object Oriented constructs for program development	3	1
3.	Analyze threads and exception handling to problem solving	2	

MODULE – 1

10 Hrs.

Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, message passing, inheritance, encapsulation, and polymorphism, relationships among objects, Difference between OOP and other conventional programming – advantages and disadvantages of OOP.

Introduction to Java: Java and Java Applications, How Java Changed the Internet, Java Development Kit(JDK), The Byte Code, Servlets, The Java Buzzwords, Object-Oriented Programming, Simple Java Programs using Control Statements and Blocks of code, Lexical Issues, Data Types, Variables, and Arrays

: The primitive Types, Integers, Floating-Point Types, Characters, Booleans, Literals, Variables, Type Conversion and Casting, Arrays, Strings, Operators : Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operator, The ? Operator, Operator Precedence. Program Control Statements: Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder,

MODULE – 2

10 Hrs.

Program Control Statements: Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops.

Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, The this keyword, Garbage collection, Overloading Methods and constructors, Argument Passing.

MODULE -3

10 Hrs.

Inheritance, Packages and Interfaces: Inheritance Basics, Using Super, Multilevel Hierarchy, When Constructors are called, Method Overriding, Abstract Classes, Interfaces.

Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, Nested try Statements, throw and throws.

Course Title	Data Science		
Course Code	21OEIS62	(L-T-P)C	(3-0-0)3
Exam	3Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Apply the principles of data science for solving real time problems			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various Data Science process like statistical modelling, Exploratory data analysis, Data visualization.	1	-
2	Apply various feature selection algorithms for effective decision making.	3	1
3	Develop effective visualization for the given data using R	5	1
MODULE – 1			10 Hrs.
Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed.			
Statistical Inference - Populations and samples, Statistical modelling, probability distributions, fitting a model.			
MODULE – 2			10 Hrs.
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. The Data Science Process, Case Study: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression			
MODULE -3			10 Hrs.
k-Nearest, Neighbors (k-NN), k-means. One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam. Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.			
MODULE -4			10 Hrs.
Feature Generation and Feature Selection Motivating Application: user (customer) retention, Feature Generation Feature Selection algorithms, Filters; Wrappers; Decision Trees, Random Forests. Data Visualization - Data Visualization History, What Is Data Science, Redux?, A Sample of Data Visualization Projects			
Text Books:			
1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk from The Frontline. O'Reilly.2014.			
Reference Books:			
2. Jure Leskovek, Anand Rajaraman and Jeffery Ullman. Mining of Massive Datasets. V2.1, Cambridge University Press. 2004.			
3. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. ISBN 0262018020. 2013.			
4. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. ISBN 1449361323. 2013.			
MOOC Course:			
1. Introduction to data Analytics nptel.ac.in/courses/110106064/E-Books: a) An Introduction to			

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	21OEIS63	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
<p>Course Objective: Students will be able to develop database applications.</p> <p>Course Outcomes: At the end of the course, student will be able to:</p>			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the concepts of Database Management Systems and its applications.	1	1
2	Design ER diagram for real world applications and develop SQL queries.	3	1
3	Apply normalizations for relation scheme.	2	1
4	Describe the issues in transaction management.	1	1
MODULE-1			10 Hrs
<p>Introduction: Introduction, an example, Characteristics of Database approach, Actors on the Screen, Workers Behind the Scene, Advantages of Using DBMS Approach. Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment.</p> <p>Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two.</p> <p>Self Study: A brief History of Database Applications</p>			
MODULE-2			10 Hrs
<p>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 and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping.</p>			
MODULE-3			10 Hrs
<p>SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL. Insert Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Schema Change Statements in SQL.</p> <p>Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.</p>			
MODULE-4			10 Hrs
<p>Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock - Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery. Crash Recovery: Introduction to ARIES. NoSQL: An overview of</p>			

Course Title	DATA WAREHOUSING AND MINING		
Course Code	21OEIS64	(L-T-P)C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40
MODULE – 1			10Hrs.
<p>Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined?, What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. Getting to know your data: Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity.</p>			
MODULE – 2			10Hrs.
<p>Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing.</p>			
MODULE -3			10Hrs.
<p>Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest-neighbour Classifier. Mining frequent patterns Association and correlations: Basic Concepts and Methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.</p>			
MODULE -4			10Hrs.
<p>Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN. Data Mining Trends and research frontiers : Data Mining Applications , Data mining and society, Data mining trends.</p>			
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Jiawei Han and Micheline Kamber: Data Mining – Concepts and Techniques, 4th Edition, Morgan Kaufmann,2018 2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education, 2020 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. K.P.Soman, Shyam Diwakar, V. Ajay, Insight into Data Mining–Theory and Practice, PHI, 2006. 			
<p>MOOC:</p> <ol style="list-style-type: none"> 1. Datawarehousingandmininghttps://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/ 			

Course Title	CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS (MANDATORY AUDIT COURSE)		
Course Code	21CIP	L-T-P	(2-0-0) 0
Exam	-	Hours/Week	2
CIE	50 Marks	Total Hours	26

Course Objective: Objective of the course is to make students learn the basic concepts and understand the fundamental rights and professional ethics to apply in engineering profession and to make the learners fundamentally strong engineers.

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

#	Course Outcomes	Mapping to PO's
1	Enumerate the significance of the preamble of the Constitution, the fundamental rights and duties.	12
2	Discuss the principles of Freedom of Speech and Expression as a professional.	10,12
3	Analyse and interpret the present scenario of the nation versus the constitutional provisions.	6,12
4	Communicate effectively the professional and ethical responsibility as an engineer and acquire applicational competence.	8,9,10

MODULE - 1

6 Hrs

Constitution of India: Evolution of Constitution of India. Salient Features of the Constitution. Preamble. Fundamental Rights-Restrictions and Important cases.

MODULE - 2

5 Hrs

Relevance of Directive Principles of State Policy. Significance of Fundamental Duties. Union Executive-The President and Vice President, Prime Minister, Council of Ministers. Parliament.

MODULE - 3

9 Hrs

State Executive-The Governor, Chief Minister, Council of ministers. Legislature. The Judiciary. Elections. Special provisions relating to certain classes- Scheduled Castes, Scheduled Tribes, women, children and backward classes. Emergency provisions.

MODULE - 4

6 Hrs

Professional Ethics: Scope and aims of engineering ethics. Responsibility of Engineers. Impediments to Responsibility. Honesty, Integrity and Reliability of Engineers. Risk, Safety and Liability in Engineering. Case Studies. Code of Ethics for Engineers.

Text Books:

1. Jain M.P, Indian Constitutional Law, 6th Edition, (New Delhi; Lexis Nexis, 2018).
2. Charles E Harries, Michael S Pritchard and Michael J Rabins, Engineering Ethics, Cengage, 2012.

Reference Books:

1. Shukla V.N., Constitution of India, (Lucknow: Eastern Book Agency,2019).
2. Basu D.D., Introduction to the Constitution of India, 24th edition, (New Delhi; Lexis Nexis, 2019).
3. Pylee M.V., An Introduction to Constitution of India, Vikas Publishing.
4. Pandey J. N., Constitutional Law of India, Central Law Agency, 2019.

Scheme of Evaluation**CIE marks: 50**

1. CIE1-25 marks (Module1 & 2 Objective type-5 marks & Descriptive type-20 marks)
2. Quiz-20 marks (Module-3)
3. Assignment -05 marks (Module-4)

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PSO1	PSO2
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3												
CO2										3		3		
CO3						3						3		
CO4								3	3	3				

Course Title	SWAYAM course -1 (Mandatory Audit Course)
Course Code	21SWY

Students should take one compulsory Swayam course-1 from the list of subjects offered by NPTEL and should clear that subject. This audit course will be considered only after submission of Certificate of completion issued by NPTEL.

Note: In case the course is not cleared student will not be awarded with degree certificate.