AUTONOMOUS

SYLLABUS

V & VI Semesters

2023

B.E in Information Science & Engineering

MITE

Invent Solutions

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Institute Vision

*"To attain perfection in providing **Globally Competitive Quality Education** to all our Students and also benefit the global community by using our strength in **Research and Development**"*

Institute Mission

*"To establish world class educational institutions in their respective domains, which shall be **Centers of Excellence** in their stated and implied sense. To achieve this objective we dedicate ourselves to meet the challenges of becoming **Visionary and Realistic**, **Sensitive and Demanding**, **Innovative and Practical,** Theoretical **and Pragmatic;** ALL at the same time"*

Department Vision

"To nurture skilled and quality professionals with a strong technical background who will excel in the dynamically changing world of information technology"

Department Mission

- *To provide quality technical education through innovative teaching methods.*
- *To outfit the students with strong programming and problem solving skills.*
- *To foster the students to meet the global competency in the information technology industry.*
- *To provide the best infrastructure and environment to its students and faculty members, to achieve excellence in technical education and research.*

Program Educational Objectives (PEOs)

- *The graduates will be quality professionals, having sound knowledge in mathematical, scientific and Information technologies to analyze and solve the real world problems.*
- *The Graduates will be technically competent to excel in the dynamically changing information technology industry and to pursue higher studies.*
- *The Graduates will have effective communication skills, leadership qualities, desire for learning, and ability to work in multidisciplinary teams to succeed in their professional career.*

Program Specific Outcomes (PSOs)

- *Ability to specify, design, develop, test and manage efficient software systems as per user requirements.*
- *Ability to develop application software that would perform tasks related to Information Management, Web Technology and Mobiles.*

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LIST OF COURSES

V/VI Semester			
Sl. No.	**Course Code**	**Course Title**	**Semester**
HUMANITIES & SOCIAL SCIENCE COURSES			
1	**23HMCC301**	Entrepreneurship, Management & Finance	V
PROFESSIONAL CORE COURSES			
2	**23ISPC302**	Database Management Systems	V
3	**23ISPC303**	Computer Networks	V
4	**23ISPC304**	Full Stack Development	V
5	**23ISPC305**	Computer Networks Lab	V
6	**23ISPC306**	Business Intelligence	VI
7	**23ISPC307**	System Engineering	VI
8	**23ISPC308**	Business Intelligence Laboratory	VI
9	**23ISPC310**	Cloud Computing	VI
SKILL ENHANCEMENT COURSE			
10	**23ISSE309**	Project Phase-I	VI
PROFESSIONAL ELECTIVE COURSES			
11	**23ISPE311**	Formal Language and Automata Theory	V
12	**23ISPE312**	Machine Learning	V
13	**23ISPE313**	Digital Image Processing	V
14	**23ISPE321**	Cryptography and Network Security	VI
15	**23ISPE322**	Software Testing	VI
16	**23ISPE323**	Compiler Design	VI
OPEN ELECTIVE COURSES			
17	**23ICOE311**	Ethical Hacking	V
18	**23ISOE312**	User Interface Design	V
19	**23CSOE313**	Java Programming	V
20	**23ICOE321**	Digital Forensics	VI
21	**23CSOE322**	Introduction to Machine Learning	VI
22	**23CSOE323**	Introduction to Data Science	VI
NON-CREDIT MANDATORY COURSES			
23	**23NMCC321**	Yoga-III	V
24	**23NMCC322**	Physical Education-III	V
25	**23NMCC323**	National Service Scheme -III	V
26	**23NMCC324**	Arts-III	V
27	**23NMCC325**	Yoga-IV	VI
28	**23NMCC326**	Physical Education-IV	VI
29	**23NMCC327**	National Service Scheme -IV	VI
30	**23NMCC328**	Arts-IV	VI

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V Semester (2023 Scheme): Information Science & Engineering

Sl. No	Course Code	Course Title	Category	Teaching Dept.	Teaching Hours /Week			Exam Marks			Duration of Exam (SEE) in Hrs	Credits
					L	T	P	CIE	SEE	Total		
1	23HMCC301	Entrepreneurship, Management & Finance	Humanities & Social Science	MBA / Any other Dept.	3	0	0	50	50	100	3	3
2	23ISPC302	Database Management Systems	Professional Core Course	CSE Allied Branches	3	0	2	50	50	100	3	4
3	23ISPC303	Computer Networks	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
4	23ISPC304	Full Stack Development	Professional Core Course	CSE Allied Branches	2	0	2	50	50	100	3	3
5	23ISPC305	Computer Networks Lab	Professional Core Course	CSE Allied Branches	0	0	2	50	50	100	3	2
6	23ISPE31X	Professional Elective -I*	Professional Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
7	23ISOE31X	Open Elective -I**	Open Elective Course	CSE Allied Branches.	3	0	0	50	50	100	3	3
8	23NMCC32X	Yoga/Physical Education /National Service Scheme /Arts***	Audit Course	Yoga Teacher/ PED/NSS Coordinator / Cultural Coordinator	0	0	1	100	-	100	-	-
											Total	**21**

Note: MOOC Requirement:

- Students are required to register and successfully complete one MOOC (Massive Open Online Course) of 8 or 12 weeks duration, offered through the NPTEL/SWAYAM platforms, between the 6th and 7th semesters.
- The list of eligible courses shall be approved and notified by the Board of Studies (BoS) of the respective discipline at least 15 days before the start of the semester.

- The successfully completed MOOC will be considered equivalent to a Professional Elective carrying 2 credits, which will be accounted for in the 8th semester.
- Students must submit the course completion certificate and the official scorecard issued by NPTEL as proof of completion.
- **Failure Policy:** Students who are unable to clear the MOOC in two consecutive attempts during the 6th and 7th semesters will be allowed to register for a Professional Elective course offered by the department in online mode during the 8th semester to earn the required 2 credits. SEE will be conducted by the department in the offline mode.

*** Professional Elective -I Course(s):**

Sl. No.	Course Code	Course Title
1	23ISPE311	Formal Language and Automata Theory
2	23ISPE312	Machine Learning
3	23ISPE313	Image Processing and Computer Vision

**** Open Elective -I Course(s):**

Sl. No.	Course Code	Course Title
1	23ICOE311	Ethical Hacking
2	23ISOE312	User Interface Design
3	23CSOE313	Java Programming

*****Yoga/Sports/NSS/Arts:**

Sl. No.	Course Code	Course Title
1	23NMCC321	Yoga-III
2	23NMCC322	Physical Education-III
3	23NMCC323	National Service Scheme -III
4	23NMCC324	Arts-III

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VI Semester (2023 Scheme): Information Science & Engineering

Sl. No	Course Code	Course Title	Category	Teaching Dept.	Teaching Hours /Week			Exam Marks			Duration of Exam (SEE) in Hrs	Credits
					L	T	P	CIE	SEE	Total		
1	23ISPC306	Business Intelligence	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
2	23ISPC307	System Engineering	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	3	2
3	23ISPC308	Business Intelligence Laboratory	Professional Core Course	CSE Allied Branches	0	1	2	50	50	100	3	2
4	23ISPC310	Cloud Computing	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	3	2
5	23ISSE309	Project Phase -I	Project	CSE Allied Branches	-	-	6	100	-	100	-	3
6	23ISPE32X	Professional Elective-II*	Professional Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
7	23ISOE32X	Open Elective -II**	Open Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
8	23NMCC32X	Yoga/Physical Education/ National Service Scheme /Arts***	Audit Course	Yoga Teacher/ PED/NSS Coordinator/ Cultural Coordinator	0	0	1	100	-	100	-	-
											Total	**18**

*** Professional Elective -II Course(s):**

Sl. No.	Course Code	Course Title
1	23ISPE321	Cryptography and Network Security
2	23ISPE322	Software Testing
3	23ISPE323	Compiler Design

**** Open Elective -II Course(s):**

Sl. No.	Course Code	Course Title
1	23ICOE321	Digital Forensics
2	23CSOE322	Introduction to Machine Learning
3	23CSOE323	Introduction to Data Science

*****Yoga/Sports/NSS/Arts:**

Sl. No.	Course Code	Course Title
1	23NMCC325	Yoga-IV
2	23NMCC326	Physical Education-IV
3	23NMCC327	National Service Scheme -IV
4	23NMCC328	Arts-IV

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ENTREPRENEURSHIP, MANAGEMENT & FINANCE			
Semester	**V**	CIE Marks	**50**
Course Code	**23HMCC301**	SEE Marks	**50**
Teaching Hrs/Week (L: T: P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives:

1. Impart key competencies, qualities, and skills of entrepreneurship.
2. Provide insights into the pathways to new venture creation.
3. Acquaint with the various concepts of management in organizations.
4. Emphasize the importance of the various functions of management in the business.
5. Familiarize the financial aspects of the various forms of organizations.

Module 1: Entrepreneur and Entrepreneurship	**No. of Hrs: 8**

Entrepreneur: Definition, Entrepreneurial competencies, Characteristics of Entrepreneurs, Qualities of an entrepreneur, Entrepreneurial skills. Developing Entrepreneurial competencies, Classification of Entrepreneurs, Entrepreneur vs Professional Managers.

Entrepreneurship: Concept, Phases of Entrepreneurship Development, Fostering Entrepreneurship, Barriers to Entrepreneurship, Factors influencing Entrepreneurship.

Textbook 1: Chapter 2, 3and 10

Module 2: Opportunities and pathways to Entrepreneurship	**No. of Hrs: 8**

Opportunity identification, Sources of Innovative ideas, Entrepreneurial imagination, and creativity, Concept of Creativity, Rules, Components, Process or phases of creativity, the critical thinking process.

Pathways to new ventures: Creating New ventures, Acquiring an established venture, Franchising.

Textbook 2: Chapter 5 and 6

Module 3: Introduction to Management	**No. of Hrs: 8**

Management: Nature, Objectives, Importance. Difference between administration and management. Levels of management, Types of managers, Managerial skills, Managerial Competencies, Scope, or Functional areas of management.

Textbook 3: Chapter 1

Module 4: Management Functions	**No. of Hrs: 9**

Functions of Management: Planning, Organizing, Staffing, Directing and Controlling.

Planning: Meaning, Features, Importance, Types, and steps. Organizing: Meaning, Need, Principles, and Process. Staffing: Meaning, Nature, and Process. Directing: Meaning, Need, Elements and Techniques. Controlling: Meaning, Need, Characteristics, Steps, and Types.

Textbook 3: Chapter 3, 4, 5 and 6

Module 5: Business Organizations and Finance	**No. of Hrs: 9**

Forms of Business Organization: Sole proprietorship, Partnership, Cooperative Society, and Company. Financial decisions in a firm, Goal of Financial Management, Fundamental principle of finance, building blocks of modern finance, Risk-return tradeoff, Emerging role of financial manager in India, Cost profit volume analysis; Profit volume ratio, Break Even Analysis and Margin of safety

Textbook 4: Chapter 1- Section 1.1, 1.2,1.3, 1.4, 1.5, 1.6 and 1.11, Chapter 13 – Section 13.4

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

1. **Outline** the entrepreneurial skills & qualities required for business development and growth.
2. **Describe** the processes of opportunity identification, creativity, and pathways to establishing new ventures
3. **Explain** the fundamental concepts of management.
4. **Apply** the functions of management in decision-making.
5. **Apply** the knowledge of financial concepts in solving business Problems.

Textbooks:

1. Vasanth Desai, "**The Dynamics of Entrepreneurial Development and Management**", 6th edition, Himalaya Publishing House, 2018
2. Donald F. Kuratko and T.V. Rao, "**Entrepreneurship: A South Asian Perspective**", 1st Edition, Cengage Learning, 2017
3. Chandrani Singh and Aditi Khatri, "**Principles and Practices of Management and Organisational Behaviour**", 5th Edition, Sage Texts, 2021
4. Prasanna Chandra, "**Financial Management- Theory and Practice**",10th Edition, Mc Graw Hill, 2022

Reference Books:

1. Deependra Sharma, "**Entrepreneurship in India**",1st Edition, Routledge India, 2023
2. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, and Sabyasachi Sinha, "**Entrepreneurship**", 11th Edition, McGraw Hill, 2022
3. Charanthimath Poornima M, "**Entrepreneurship Development and Small Business Enterprises**", 3rdEdition, Pearson, 2018

Web links:

1. Introduction to Entrepreneur: https://www.youtube.com/watch?v=rbmz5VEW90A
2. Pathways to new creations: https://www.youtube.com/watch?v=zkgbss81QKE
3. Concepts of Management: https://www.youtube.com/watch?v=GZ2dmbDmB5I
4. Functions of Management: https://www.youtube.com/watch?v=Vq8GChMK5Zg
5. Types of Business Organizations: https://www.youtube.com/watch?v=UGSlED1Jx1Y

DATABASE MANAGEMENT SYSTEM			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPC302**	SEE Marks	**50**
Teaching Hrs/Week (L: T: P)	**3:0:2**	Exam Hrs	**3**
Total Hrs	**64(40+24)**	Credits	**4**

Course Learning Objectives: This course is designed to

1. Impart foundational knowledge of database concepts.
2. Provide insights of the relational data model and data retrieval operations using relational algebra.
3. Emphasize the importance of normalization for effective database design.
4. Familiarize SQL queries for various data retrieval scenarios

Module 1: Introduction to Databases	**No. of Hrs: 7**

Introduction, Characteristics of database approach, Database Users, Advantages, Evolution of database applications, Disadvantages, Data Models, Schemas, Instances, Three schema architecture, data independence, Database languages, Interfaces, The Database System environment, Centralized and Client/Server architecture of DBMS.
Text Book 1: Chapter 1.1 to 1.9 , Chapter 2.1 to 2.5

Module 2: Data Models	**No. of Hrs: 9**

Entity types, Entity Sets, structural constraints, Weak entity types, ER diagrams, Naming Conventions and Design Issues.
Relational Model: Concepts, Constraints, relational database schemas, Update operations, Transactions, Dealing with constraint violations.
Relational Algebra: Unary Operations- SELECT and PROJECT, Set Theory - UNION, INTERSECTION and MINUS, Binary Operations - JOIN and DIVISION, Aggregate Functions, Examples Queries, Relational Database Design using ER-to-Relational mapping.
Text Book 1: Chapter 3.3 to 3.7, Chapter 5.1 to 5.3, Chapter 8.1 to 8.5, Chapter 9.1

Module 3: Normalization	**No. of Hrs:**

Database Design Theory and Normalization: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inference Rules.
Text Book 1: Chapter 14.1 to 14.7, Chapter 15.1

Module 4: Query Processing	**No. of Hrs: 9**

SQL data types, DDL, DML and DCL, specifying constraints in SQL, Basic retrieval queries in SQL, Nested and Correlated nested queries, Joined tables, outer joins, Aggregate functions, Assertions, Triggers, Views.
Text Book 1: Chapter 6.1 to 6.4, Chapter 7.1 to 7.4

Module 5: Transaction Management	**No. of Hrs: 7**

Introduction to Transaction Processing, Transaction and System concepts, ACID properties, Characterizing schedules based on serializability, Transaction support in SQL. Two-Phase Locking Techniques, Recovery Concepts, Shadow Paging, ARIES Recovery Algorithm.
Text Book 1: Chapter 20.1, 20.2.1, 20.3, 20.5.1, 20.5.2, 20.6, Chapter 21.1 .1, Chapter 22.1.3, 22.4, 22.5

Laboratory Component:	**No. of Hrs: 24**

I. Create a **Library Management System database system**. The system should help a college library maintain information about **books, students, borrowing activity, and staff**. Add following constraints

- StudentID, ISBN, StaffID, and BorrowID must be **primary keys** in their respective tables.
- StudentID and ISBN in BorrowedBooks must be **foreign keys** referencing Students and Books.
- Ensure Email in Students is **unique**.
- Ensure CopiesAvailable is a **non-negative integer**.
- Add **NOT NULL** constraints to all essential fields.

(Use CREATE TABLE statements to define the schema, and show that the constraints are properly set using DESCRIBE or SHOW CREATE TABLE)

Hint: *Each student has an ID, name, department, email, and year of study., Each book has a unique ISBN, title, author, publisher, and number of copies available., Each staff member has an ID, name, position, and contact number. Borrowing activity: which student borrowed which book, on what date, and when it is due for return.*

II. Design a database for managing the data for an **Online Food Delivery System** that allows customers to order food from various restaurants. Create a database containing the following tables:

- **Customers**(CustomerID, Name, Phone, Email, Address)
- **Restaurants**(RestaurantID, Name, Location, Cuisine)
- **MenuItems**(ItemID, RestaurantID, ItemName, Price)
- **Orders**(OrderID, CustomerID, ItemID, Quantity, OrderDate, Status)

Demonstrate following operations:

1. Add 3 new customers.
2. Add a new restaurant and at least 3 menu items for it.
3. Record a few new orders placed by customers for menu items.
4. Update the phone number of a customer.
5. Change the price of a menu item (e.g., increase price by 10%).
6. Update the status of an order to "**Delivered**".
7. Delete a customer who has not placed any orders.
8. Delete a menu item that is no longer available.
9. Delete an order that was cancelled by the customer

III. You are managing data for a **Hospital Management System**. The system has several interrelated tables storing information about **patients, doctors, appointments**, and **treatments**. Create a database containing the following tables:

- **Patients**(PatientID, Name, Gender, Age, Phone)
- **Doctors**(DoctorID, Name, Specialty, Phone)
- **Appointments**(AppointmentID, PatientID, DoctorID, AppointmentDate, Status)
- **Treatments**(TreatmentID, AppointmentID, Diagnosis, Prescription, Cost)

Demonstrate the following operations

1. Retrieve the names and phone numbers of all patients above age 60.
2. List all doctors who specialize in "**Cardiology**".
3. Find all appointments that are marked as "**Pending**".
4. Retrieve the name of each patient, the doctor they visited, and the date of the appointment.
5. Show the doctor name, specialty, and total number of appointments they have handled.
6. List all patients with their prescribed treatment and the cost, even if some appointments do not have treatments yet.
7. Find patients who have visited doctors specializing in "**Dermatology**".
8. Get a list of all appointments along with patient name, doctor name, diagnosis, and cost (if available).

IV. The database of an **E-Commerce Order Management System** tracks **customers**, their **orders**, and the **products** they purchase. Create a database containing the following tables:

- **Customers**(CustomerID, Name, City)
- **Products**(ProductID, ProductName, Category, Price)
- **Orders**(OrderID, CustomerID, OrderDate, TotalAmount)
- **OrderItems**(OrderItemID, OrderID, ProductID, Quantity, UnitPrice)

Demonstrate the following operations

1. Find all customers who placed an order with a total amount **greater than the average order amount**.
2. List the names of products that have a **higher price than the most expensive product in the 'Books' category**.
3. Retrieve the names of customers who **have never placed any order**.
4. List all customers who have **ordered more than 3 different products**.
5. Find the names of products that have been **ordered more than once by the same customer.**
6. Display customers who have placed **at least one order in the last 30 days**, along with the number of such orders.
7. Show the product(s) with the **highest unit price** in each category.
8. List the names of customers **whose every order total is above ₹500.**

V. Create a database for developing reports for a **University Student Management System** that maintains academic data about students, courses, and grades with following tables

- **Students** (StudentID, Name, Department)
- **Courses** (CourseID, CourseName, Credits)
- **Enrollments** (EnrollmentID, StudentID, CourseID, Semester, Grade)

Demonstrate the following operations

1. Count the number of students enrolled in each department.
2. Calculate the **average grade per course**.
3. List the **total number of courses taken by each student**.
4. Find the **highest and lowest grade** received in each course.

5. Get the **total number of students enrolled in each course**.
6. List all courses where the **average grade is greater than 75**.
7. Find students who have enrolled in **more than 5 courses**.
8. Display departments with **more than 100 students**.
9. Identify the course(s) with the **maximum enrollments** in a given semester.
10. Show students who have a **cumulative average grade greater than 80**.

VI. You are managing the backend for an Employee Payroll System in a company. The HR department maintains a EMPLOYEE table containing the following fields: EmpID, Name, Department, Designation, and Salary. The company wants to track salary changes to ensure transparency and detect unauthorized modifications. Any time a new employee is added, an existing employee's salary is updated, or an employee record is deleted, a trigger should automatically fire. In particular, for salary updates, the system should calculate and display the difference between the old salary and the new salary.

VII. You are developing an automated HR system for a mid-sized company that tracks employee performance, promotions, and compensation. The EMPLOYEE table stores key employee information including: EmployeeID, Name, Department, Salary, Rank, and Bonus. To support fair promotion policies and ensure accurate compensation calculations, the company enforces the following rules:

1. **Promotions Based on Salary Increases**: If an employee's salary is increased by more than 10%, they are considered for a performance-based promotion. The system should automatically increment the employee's Rank by 1.
2. **Bonus Synchronization**: The company provides a bonus of 3% of the employee's current salary. Whenever the salary is updated, the Bonus field must automatically be updated to reflect 3% of the new salary value.

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

1. **Describe** relational database concepts and transaction management.
2. **Apply** relational data model concepts to design a database.
3. **Apply** normalization techniques to minimize data redundancy.
4. **Apply** relational data model operations for effective retrieval.

Textbooks:

1. **Fundamentals of Database Systems**, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, Pearson, 2017.

Reference Books:

1. **Database management systems**, Ramakrishnan, and Gehrke, 3rd Edition, McGraw Hill, 2014.
2. Silberschatz Korth and Sudharshan, **Database System Concepts**, 7th Edition, Mc-Graw Hill, 2019.
3. Coronel, Morris, and Rob, **Database Principles Fundamentals of Design, Implementation Management**, 10th Edition, Cengage Learning, 2014.

Web links:

1. Database Languages: https://www.youtube.com/watch?v=9TwMRs3qTcU
2. ER Model: https://www.youtube.com/watch?v=ZWl0Xow304I
3. Relational Algebra: https://www.youtube.com/watch?v=4YilEjkNPrQ
4. ER Diagram to ER Model: https://www.youtube.com/watch?v=CZTkgMoqVss
5. Basic SQL Queries: https://www.youtube.com/watch?v=Hl4NZB1XR9c
6. Normal Forms: https://www.youtube.com/watch?v=EGEwkad_llA
7. Transaction & Concurrency Control: https://www.youtube.com/watch?v=t5hsV9lC1rU

COMPUTER NETWORKS			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPC303**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives:

1. Impart the knowledge of the TCP/IP protocol suite, switching mechanisms, and Medium Access Control protocols for both reliable and noisy communication channels.
2. Provide insight into network layer functionalities and Internet Protocol (IP)
3. Provide knowledge on transport layer operations and characteristics of UDP and TCP protocols.
4. Impart knowledge on application layer protocols and their real-world applications.

Module 1: Introduction and Physical layer	**No. of Hrs: 8**

Introduction: Data Communications, Networks, Network Types, Network Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer: signals, signal impairment, multiplexing. Switching: Packet Switching and its types.
Text Book 1: Chapter 1, Chapter 2, Chapter 8

Module 2: Data Link Layer	**No. of Hrs: 9**

Data Link Layer: Framing, Error Detection and Correction: Introduction, Block Coding, Cyclic Codes. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control. Media Access Control: Random Access, Controlled Access. Check Sum and Point to Point Protocol, Ethernet.
Text Book 1: Chapter 10, Chapter 11, Chapter 12

Module 3: Network Layer	**No. of Hrs: 8**

Network layer Services, performance, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms, Unicast Routing Protocols: DVR, LSR, PVR, Unicast Routing protocols: RIP, OSPF, Multicasting Routing-MOSPF
Text Book 1: Chapter 18, Chapter 20, Chapter 21

Module 4: Transport Layer	**No. of Hrs: 8**

User Datagram Protocol: UDP Services, applications, Transmission Control Protocol: TCP services, features, segments, TCP connections, flow control, Error control, Congestion control.
Text Book 1: Chapter 24

Module 5: Application Layer	**No. of Hrs: 9**

Introduction, Client-Server Programming, Standard Client-Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System(DNS), Secure Shell (SSH),Socket Interface programming
Text Book 1: Chapter 25, Chapter 26

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

1. **Explain** the components and layered architecture of the TCP/IP protocol suite.
2. **Apply** data link layer techniques in network communication.
3. **Demonstrate** the application of routing protocols to facilitate network layer functionalities.
4. **Apply** transport layer protocols for TCP/UDP services, connections, and flow control mechanisms.
5. **Illustrate** application layer protocols in real word application.

Textbooks:

1. Behrouz A. Forouzan, **Data Communications and Networking with TCPIP Protocol Suite**, 5th Edition, Tata McGraw-Hill,2022.

Reference Books:

1. Larry L. Peterson and Bruce S. Davie: **Computer Networks – A Systems Approach**, 4th Edition, Elsevier, 2019.
2. Nader F. Mir: **Computer and Communication Networks**, 2nd Edition, Pearson Education,2015
3. William Stallings, **Data and Computer Communication** 10th Edition, Pearson Education, Inc.,2014.

Web links:

1. Computer Networks and Internet Protocol: https://www.digimat.in/nptel/courses/video/106105183/L01.html
2. Computer Networks: Crash Course: https://www.youtube.com/watch?v=3QhU9jd03a0
3. Computer networks: https://nptel.ac.in/courses/106105080

FULL STACK DEVELOPMENT			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPC304**	SEE Marks	**50**
Teaching Hrs/Week (L:T: P)	**2:0:2**	Exam Hrs	**03**
Total Hrs	**26+26**	Credits	**03**

Course Learning Objectives: This course is designed to

1. Impart knowledge of JavaScript and DOM for interactive web development.
2. Provide insights into the MERN stack and React component development.
3. Teach state management, event handling, and component communication in React.
4. Develop skills in building RESTful APIs with Express and using GraphQL.
5. Provide insights into backend development with Node.js and MongoDB.

Module 1: JavaScript and DOM Manipulation	**No. of Hrs: 6**

Basic JavaScript Instructions, Statements, Comments, Variables, Data Types, Decisions & Loops, Functions, Methods & Objects, Functions & Methods, Objects & Arrays.
DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, Events, Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.
Text Book 1: Chapter 2, Chapter 3, Chapter 4, Chapter 5, Chapter 6

Module 2: MERN and React Components	**No. of Hrs: 5**

Introduction to MERN: MERN components, Serverless Hello world program.
React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.
Text Book 2: Chapter 1, Chapter 3

Module 3: React State	**No. of Hrs: 5**

React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components
Text Book 2: Chapter 4

Module 4: Express and APIs	**No. of Hrs: 5**

Express: Routing, Request Matching, Route Parameters, Route Lookup, Handler Function, Request Object, Response Object, Middleware, REST API, Resource Based, HTTP Methods as Actions, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.
Text Book 2: Chapter 5

Module 5: Node JS and MongoDB	**No. of Hrs: 7**

Node JS: Setting up Node.js, Callbacks and Events, File System, Buffers & Streams.
MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, Reading from MongoDB, Writing to MongoDB
Text Book 2: Chapter 6

Laboratory Component:	**No. of Hrs: 26**
1. Write a script that logs "Hello, World!" to the console. Create a script that calculates the sum of two numbers and displays the result in an alert box.	
2. Create an array of 5 cities and perform the following operations: • Log the total number of cities. • Add a new city at the end. • Remove the first city. • Find and log the index of a specific city.	
3. Read a string from the user, Find its length. Extract the word "JavaScript" using substring() or slice(). Replace one word with another word and log the new string. Write a function isPalindrome(str) that checks if a given string is a palindrome (reads the same backward).	
4. Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details). Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object.	
5. Create a button in your HTML with the text "Click Me". Add an event listener to log "Button clicked!" to the console when the button is clicked. Select an image and add a mouseover event listener to change its border color. Add an event listener to the document that logs the key pressed by the user.	
6. Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description, and status (e.g., Open/Closed). Render the list using a functional component.	
7. Create a component Counter with a state variable count initialized to 0. Create buttons to increment and decrement the count. Simulate fetching initial data for the Counter component using useEffect (functional component) or componentDidMount (class component). Extend the Counter component to double the count value when a button is clicked. Reset the count to 0 using another button.	
8. Install Express (npm install express). Set up a basic server that responds with "Hello, Express!" at the root endpoint (GET /).	
9. Create a REST API. Implement endpoints for a Product resource: • GET /products: Returns a list of products. • POST /products: Adds a new product. • GET /products/:id: Returns details of a specific product. • PUT /products/:id: Updates an existing product. • DELETE /products/:id: Deletes a product. Add middleware to log requests to the console. Use express.json() to parse incoming JSON payloads.	
10. Install the MongoDB driver for Node.js. Create a Node.js script to connect to the shop database. Implement insert, find, update, and delete operations using the Node.js MongoDB driver.	
11. Define a product schema using Mongoose. Insert data into the products collection using Mongoose. Create an Express API with a /products endpoint to fetch all products.	

12. Use fetch in React to call the /products endpoint and display the list of products. Add a POST /products endpoint in Express to insert a new product. Update the Product List: After adding a product, update the list of products displayed in React.

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

1. **Design** dynamic web pages using JavaScript and DOM manipulation.
2. **Build** reusable React components and understand MERN stack architecture.
3. **Implement** state management, event handling, and component interactions in React.
4. **Develop** and integrate RESTful APIs using Express and explore GraphQL.
5. **Apply** Node.js and MongoDB for backend development and data management.

Textbooks:

1. "**JavaScript & jQuery: Interactive Front-End Web Development**" by Jon Duckett 2014 John Wiley & Sons
2. "**Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node**" by Vasan Subramanian. Apress, 2019.

Reference Books:

1. Juha Hinkula "**Full Stack Development with Spring Boot 3 and React: Build modern web applications using the power of Java, React, and TypeScript**".

Web links:

1. NPTEL Course: Joy of Computing Using Python: https://nptel.ac.in/courses/106106156
2. NPTEL Course: Database Management System: https://archive.nptel.ac.in/courses/106/105/106105084/

COMPUTER NETWORKS LABORATORY			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPC305**	SEE Marks	**50**
Teaching Hrs/Week (L: T: P)	**0:1:3**	Exam Hrs	**3**
Total Hrs	**36**	Credits	**2**

Course Learning Objectives: This course is designed to

1. Impart knowledge to simulate and analyze network topologies and data communication protocols using tools like Cisco Packet Tracer and Python.
2. Provide knowledge on network programming techniques to implement and troubleshoot application and network layer protocols using Python and Wireshark.
3. Impart knowledge to Analyze and interpret packet-level network behavior including routing, addressing, protocol communication, and data transmission performance using real-time tools and scripts.

Laboratory Component:	**No. of Hrs: 36**

1. **Simulation of Bus, Ring, and Star Topologies** using Packet Tracer and Observe data flow and collision handling
2. **Implementing Data Link Layer Protocol** – Stop-and-Wait ARQ
3. **Implementing Data Link Layer Protocol** – Sliding Window Protocol
4. **IP Addressing and Subnetting:** Design subnetting schemes and assign IP addresses using Packet Tracer. Use DHCP server configuration
5. **Static and Dynamic Routing Configuration:** Configure routing tables manually and Observe path changes using dynamic routing protocols. Use Packet Tracer.
6. **VLAN Configuration on Switches:** Implement VLANs and observe inter-VLAN communication. Configure multiple VLANs -Configure router-on-a-stick for inter-VLAN routing. Use Packet Tracer
7. **Implementing Network Layer Protocol – IP Packet Fragmentation and Reassembly:** Simulate IP packet fragmentation-Implement packet fragmentation logic and Reassembly at the destination
8. **Implementing Application Layer Protocol – Simple Client-Server (HTTP, DNS, FTP):** Create simple client-server models to simulate application layer protocols- HTTP server/client- DNS resolution- FTP file transfer. Use Python (Sockets), Wireshark
9. **Packet Sniffing and Analysis Using Wireshark:** Capture and analyze packets at all layers.-Analyze TCP 3-way handshake- Observe ARP, DHCP, DNS packets- Filter protocols in Wireshark
10. **Monitoring Network Traffic Using Python/Bash Scripts:** Write a script to monitor incoming and outgoing traffic- Display traffic per interface- Store data in logs. Use Python, psutil, nload, iftop

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

1. **Apply** network simulation tools to configure and analyze different network topologies and routing techniques including static and dynamic routing protocols.
2. **Implement** data link and network layer protocols such as Stop-and-Wait ARQ, Sliding Window, and IP packet fragmentation using simulation and programming tools.
3. **Develop** and test simple network applications and scripts for client-server communication, protocol analysis, and traffic monitoring using Python and Wireshark.

Textbooks:

1. Behrouz A. Forouzan, **Data Communications and Networking with TCPIP Protocol Suite**, 5th Edition, Tata McGraw-Hill,2022.

Reference Books:

1. Larry L. Peterson and Bruce S. Davie: **Computer Networks – A Systems Approach**, 4th Edition, Elsevier, 2019.
2. Nader F. Mir: **Computer and Communication Networks**, 2nd Edition, Pearson Education,2015
3. William Stallings, **Data and Computer Communication** 10th Edition, Pearson Education, Inc.,2014.

Web links:

1. Packet tracer introductory course: https://www.netacad.com/courses/getting-started-cisco-packet-tracer?courseLang=en-US

FORMAL LANGUAGES AND AUTOMATA THEORY			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPE311**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives:

1. Impart knowledge on fundamental concepts of formal languages, automata theory, and their importance in computing.
2. Provide knowledge on types of automata, including DFA, NFA, and PDA, and their language recognition capabilities.
3. Impart knowledge on regular expressions, context-free grammars, and pushdown automata for language generation and recognition.
4. Impart knowledge on computational power of Turing machines and undecidable problems in computability theory.

Module 1: Introduction to Formal Languages and Finite Automata	**No. of Hrs: 9**

Introduction to Formal Languages: Need for Automata Theory, The central concepts of Automata theory- Alphabet, String, Language, A machine-based hierarchy of language class
Finite Automata: Deterministic Finite Automata, Nondeterministic Finite Automata, Finite Automata with Epsilon Transition, Equivalence and Minimization of Automata
Text Book 1: Chapter 1.1, 1.5, Chapter 2.2, 2.3.1 to 2.3.5, 2.5, Chapter 4.4
Text Book 2: Chapter 3.3

Module 2: Regular Expression, Properties of Regular Languages	**No. of Hrs: 8**

Regular Expression, Properties of Regular Languages: Regular Expressions, Finite Automata and Regular Expressions, Proving Languages Not to Be Regular, Closure Properties of Regular Language
Text Book 1: Chapter 3.1, 3.2.2, 3.2.3, Chapter 4.1, 4.2

Module 3: Context-Free Grammars and Languages	**No. of Hrs: 8**

Context-Free Grammars and Languages: Context –Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Closure properties of Context- Free Languages
Text Book 1: Chapter 5.1, 5.2, 5.4, Chapter 7.3

Module 4: Properties of Context Free Languages and Pushdown Automata	**No. of Hrs: 9**

Properties of Context Free Languages: Normal forms for Context- Free Grammar
Pushdown Automata: Definition of the Pushdown automata, The languages of a PDA, Equivalence of PDA's and CFG's: From Grammars to Pushdown Automata, Deterministic Pushdown Automata
Text Book 1: Chapter 7.1, Chapter 6.1 to 6.3.1, 6.4

Module 5: Introduction to Turing Machine and Undecidability	**No. of Hrs: 8**

Introduction to Turing Machine: Problems That Computers Cannot Solve, The Turning Machine, Programming Techniques for Turning Machines, Extensions to the Basic Turning Machines
Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That is RE, Post Correspondence Problem
Text Book 1: Chapter 8.1 to 8.4, Chapter 9.1, 9.2, 9.4.1

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

1. **Apply** automata concepts to construct and optimize finite automata using equivalence and minimization techniques.
2. **Apply** regular expressions and finite automata to recognize languages, prove non-regularity, and utilize closure properties.
3. **Apply** context-free grammars to generate languages, construct parse trees, resolve ambiguity, and explore closure properties.
4. **Apply** context-free grammar transformations, design pushdown automata, and establish PDA-CFG equivalence for language recognition.
5. Apply Turing machines to develop computation models and solve undecidable problems.

Textbooks:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: **Introduction toAutomata Theory, Languages and Computation**, 3rd Edition, Pearson Education, 2007.
2. Elaine Rich: **Automata, Computability and Complexity, Theory and Applications**, Pearsons Education,2018.

Reference Books:

1. K.L.P.Mishra: **Theory of Computer Science, Automata, Languages, and Computation**, 3rd Edition, PHI Learning, 2009.
2. Raymond Greenlaw, H. James Hoover: **Fundamentals of the Theory of Computation, Principles and Practice**, Elsevier, 1998.
3. John C Martin: **Introduction to Languages and Automata Theory**, 3rd Edition, Tata McGraw-Hill,2007.
4. Thomas A. Sudkamp: **An Introduction to the Theory of Computer Science, Languages and Machines**, 3rd Edition, Pearson Education, 2006.

Web links:

1. Full course: https://www.digimat.in/nptel/courses/video/106104028/

MACHINE LEARNING			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPE312**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives:

1. Impart knowledge of fundamental concepts in machine learning.
2. Impart insights in to learning theories and their applications in machine learning.
3. Provide insights into Regression analysis and learning models for prediction and classification.
4. Provide knowledge on learning models using artificial neural networks and support vector classification.
5. Impart knowledge on clustering and reinforcement learning techniques.

Module 1: Introduction & Understanding Data	**No. of Hrs: 8**

Introduction to Machine Learning: Need for Machine Learning, Machine Learning in Relation to other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Applications.
Understanding Data: Introduction to Data types, Bigdata Analytics and Types of Analytics, Bigdata Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization
Text Book 1: Chapter: 1, Chapter: 2.1 to 2.5.2

Module 2: Basics of Learning & Similarity based Learning	**No. of Hrs: 8**

Basics of Learning: Introduction to Learning and its Types, Introduction to Computation Learning Theory, Design of Learning System, Introduction to Concept Learning, Induction Biases, and Modelling in Machine Learning.
Similarity based Learning: Introduction to Similarity or Instance-Based Learning, Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier.
Text Book 1: Chapter: 3.1 to 3.4, Chapter: 4.1 to 4.5

Module 3: Regression, Decision Tree & Bayesian Learning	**No. of Hrs: 9**

Regression Analysis: Introduction to Regression, Introduction to Linearity Correlation and Causation, Introduction to Linear Regression, Logistic Regression.
Decision Tree Learning: Introduction to Decision Tree Learning Model, Decision Tree Induction Algorithms. Validating and Decision Trees
Bayesian Learning: Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model, Naïve Bayes Algorithm
Text Book 1: Chapter: 5.1 to 5.3 & 5.7, Chapter: 6.1 to 6.2.1 & 6.3, Chapter: 8.1 to 8.3.1

Module 4: Artificial Neural Networks & Support Vector Machines	**No. of Hrs: 8**

Artificial Neural Networks: Biological Neurons, Artificial Neurons, Perceptron and Learning Theory, Backpropagation, Types of Artificial Neural Networks, Popular Applications of Artificial Neural Networks, Advantages and Disadvantages of ANN
Support Vector Machines: Introduction to Support Vector Machines, Functional and Geometric Margin, Hard Margin SVM as an Optimization Problem, Soft Margin SVM
Text Book 1: Chapter: 10.1 to 10.5 & 10.10 to 10.11, Chapter: 11.1 &11.4 to 11.5

Module 5: Unsupervised & Reinforcement Learning	**No. of Hrs: 9**

Clustering Algorithms: Introduction to Clustering Approaches, Proximity Measures, Hierarchical Clustering Algorithms, Partitional Clustering Algorithm, Density-based Methods, Grid-based Approach.

Reinforcement Learning: Overview of Reinforcement Learning, Scope of Reinforcement Learning, Reinforcement Learning as Machine Learning, Components of Reinforcement Learning, Markov Decision Process, Multi-Arm Bandit Problem and Reinforcement Problem Types, Model-based Learning

Text Book 1: Chapter: 13.1 to 13.6, Chapter: 14.1 to 14.7

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

1. **Articulate** fundamental concepts, techniques, and applications of machine learning across various domains.
2. **Apply** computational learning theories and similarity-based learning techniques to solve classification problems.
3. **Apply** regression models, decision trees, and Bayesian classification techniques to solve real-world data problems.
4. **Build** probabilistic learning models and design neural network models using perceptron and multilayer architectures
5. **Apply** clustering and reinforcement learning techniques to solve real world problems.

Textbooks:

1. S Sridhar, M Vijayalakshmi, "**Machine Learning**", Oxford University Press 2021, First Edition.

Reference Books:

1. Murty, M. N., and V. S. Ananthanarayana. **Machine Learning: Theory and Practice**, Universities Press, 2024.
2. T. M. Mitchell, "**Machine Learning**", McGraw Hill, 1997.
3. Burkov, Andriy. **The Hundred-page Machine Learning Book**. Vol. 1. Quebec City, QC, Canada: Andriy Burkov, 2019

Web links:

1. Introduction to Machine Learning: https://onlinecourses.nptel.ac.in/noc22_cs29/preview
2. Machine Learning Tutorials: https://www.geeksforgeeks.org/machine-learning/
3. Python for Machine Learning: https://www.w3schools.com/python/python_ml_getting_started.asp

DIGITAL IMAGE PROCESSING			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISPE313**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives:

1. Impart Knowledge on image acquisition, sampling, quantization, and applications in image processing.
2. Emphasize spatial and frequency domain techniques to enhance digital images.
3. Provide knowledge on image segmentation techniques like edge detection, thresholding, and region-based methods.
4. Impart Knowledge on Extract and describe boundary, region, and whole-image features for image analysis.
5. Provide knowledge to analyze and classify patterns using prototype matching, statistical methods, and neural networks

Module 1: Image Processing Foundations	**No. of Hrs: 7**

Introduction: Digital Image fundamentals, Image Sensing and acquisition, Sampling and Quantization, Image formation models, Overview of Computer Vision, Applications of Image processing and Computer Vision
Text Book 1: Chapter-2.1,2.2,2.3,2.4

Module 2: Image Enhancement	**No. of Hrs: 9**

Image Enhancement: Some Basic Intensity Transformation Functions, Histogram Processing, Fundaments of Spatial Filtering, Image enhancement process in frequency domain, Lowpass and High pass Filters.
Morphological Image Processing: Morphology, Some Basic Morphological techniques, Morphological Reconstruction.
Text Book 1: Chapter–3.2,3.3,3.4,3.5,3.6 Chapter–9.1,9.5,9.6

Module 3: Image Segmentation	**No. of Hrs: 9**

Image Segmentation: Fundaments, Point, Line, and Edge Detection, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging. Region Segmentation using Clustering and Super pixels, Region Segmentation Using Graph Cuts.
TextBook-1: Chapter– 10.1,10.2,10.3,10.4,10.5,10.6

Module 4: Feature Extraction	**No. of Hrs: 9**

Feature Extraction: Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features.
TextBook-1: Chapter–11.1,11.2,11.3,11.4,11.5,11.6

Module 5: Image Pattern Classification	**No. of Hrs: 8**

Pattern Analysis: Patterns and Pattern Classes, Pattern Classification by Prototype Matching, Optimum (Bayes) Statistical Classifiers, Neural Networks and Deep Learning.
TextBook-1: Chapter–12.2, 12.3, 12.4, 12.5.

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

1. **Explain** Image acquisition, enhancement, segmentation, feature extraction, and classification
2. **Apply** spatial and frequency domain techniques to improve the quality of digital images.

3. **Apply** segmentation methods such as edge detection, thresholding, and region-based techniques 4. **Apply** feature extraction methods for image processing 5. **Use** classification approaches like prototype matching, statistical methods, and neural networks for pattern recognition
Textbooks: 1. **Digital Image Processing**- Refael C. Gonzalez and Richard E. Woods, Wesley
Reference Books: 1. **Computer Vision - A Modern Approach**, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill. 2. **Computer Vision**, D. H. Ballard, C. M. Brown, Prentice-Hall, Englewood Cliffs, 1982.
Web links: 1. https://onlinecourses.nptel.ac.in/noc19_cs58/preview 2. https://onlinecourses.nptel.ac.in/noc19_ee55/preview

ETHICAL HACKING			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICOE311**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives:

1. Equip students with a comprehensive understanding of the ethical implications, legal considerations, and best practices associated with ethical hacking.
2. Teach students various methodologies for conducting penetration tests, including reconnaissance, enumeration, and exploitation, to assess system security effectively.
3. Introduce industry-standard tools such as Nmap and Metasploit for vulnerability assessment, network scanning, and exploitation techniques.
4. Cover documentation and presentation of penetration testing results through detailed reports and presentations.

Module 1: Introduction to Ethical hacking and Footprinting	**No. of Hrs: 9**

Introduction: Importance of Security, Elements of Security, Phases of an Attack: Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks. Types of Hacker Attacks, Hacktivism, Ethical Hackers, Vulnerability Research, Conducting Ethical Hacking, Computer Crimes and Implications.

Introduction to Footprinting: Information-Gathering Methodology, Footprinting Tools, WHOIS Tools, DNS Information Tools, Network Range Locator Tools, Email spiders, Locating Network Activity, Meta Search Engines.

TextBook-1: Chapter 1, Chapter 2

Module 2: Scanning	**No. of Hrs: 9**

Introduction to Scanning: Scanning Definition, Objectives of Scanning, Scanning Methodology: Checking for live systems, check for open ports: Three-Way Handshake, TCP Communication Flags, Scanning Methods, War Dialing, Active Banner Grabbing Using Telnet. Fingerprint the operating system: Active stack fingerprinting, Passive stack fingerprinting, Scan for vulnerability: OpenVAS and Nikto, Probing the network: Preparing Proxies, Anonymizers. Surfing Anonymously: HTTP Tunneling, Spoofing IP Addresses, Detecting IP Spoofing, Scanning Countermeasures. Tools: Live System Scanning Tools, Port Scanning Tools

TextBook-1: Chapter 3

Module 3: Enumeration	**No. of Hrs: 8**

Introduction to Enumeration, Enumeration Techniques: Null Session Enumeration-Windows Session Establishment, Null Sessions, Null Session Vulnerabilities, Null Session Enumeration Techniques, Null Session Countermeasures. SNMP Enumeration-SNMP, SNMP Service Enumeration, SNMP Enumeration Countermeasures, SNMP UNIX Enumeration, SNMP UNIX Countermeasures. UNIX Enumeration- Showmount, Finger, Rpcinfo, LDAP Enumeration, NTP Enumeration, SMTP Enumeration, Web Enumeration, Web Application Directory Enumeration, Default Password Enumeration, Enumeration Procedure.

Tools: Null Session Tools-DumpSec, enum. User Account Tools-GetAcct. Null Session Countermeasure Tools-PsTools: PsExec, PsKill, PsList, SNMP Enumeration Tools-Snmputil, Solar Winds. LDAP Enumeration Tools- JXplorer, LdapMiner. SMTP Enumeration Tools-SMTPscan. General Enumeration Tools- NBTscan, Unicornscan.

TextBook-1: Chapter 4

Module 4: System Hacking	**No. of Hrs: 8**
Introduction to System Hacking: Cracking Passwords, Four Types of Password Attacks: Passive online attacks, Active online attack, offline attacks and Non Technical Attacks: Shoulder Surfing, Keyboard Sniffing, Social Engineering ,Password Guessing, Password Cracking Tools: LCP, ophcrack, Crack , Password Cracking Countermeasures, Escalating Privileges, Executing Applications, Keyloggers and Spyware, Keylogger and Spyware Countermeasures, Hiding Files, Rootkits, Rootkit Detection Tools, Steganography, Hiding the Data, Steganography Tools, Steganography Detection, Steganalysis Tools, Covering Tracks-Tools. **TextBook-1:** Chapter 5	
Module 5: Penetration Testing	**No. of Hrs: 8**
Introduction to Penetration Testing: Security Assessments, Types of Penetration Testing, Phases of Penetration Testing: Planning Phase: Risk Management, Pretest Dependencies, Enumerating Devices, Threats, Pre Attack Phase: Passive Reconnaissance, Active Reconnaissance, Network Mapping, Attack Phase, Postattack Phase, Tools: Nessus, SAINT, Metasploit, **TextBook-1:** Chapter 6	
Course Outcomes: At the end of the course, the student will be able to 1. **Explain** security fundamentals, ethical hacking, attack methods, and footprinting for ethical information gathering. 2. **Perform** network scanning, vulnerability assessment, and anonymization for risk identification and countermeasures. 3. **Analyze** the role of enumeration in identifying system vulnerabilities and apply appropriate mitigation techniques. 4. **Examine** system hacking techniques and implement corresponding defense mechanisms to secure systems. 5. **Analyze** penetration testing methodologies for effective vulnerability assessment and mitigation.	
Textbooks: 1. The Experts: EC-Council, "**Ethical Hacking and Countermeasures Attack Phases**", Course Learning, Cengage Learning.	
Reference Books: 1. James S. Tiller, "**The Ethical Hack: A Framework for Business Value Penetration Testing**", Auerbach Publications, CRC Press. 2. Michael Simpson, Kent Backman, James Corley, "**Hands-On Ethical Hacking and Network Defense**", Cengage Learning. 3. Gray Hat **Hacking - The Ethical Hackers Handbook**, Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, 3rd Edition, Tata McGraw-Hill	
Web links: 1. https://www.youtube.com/watch?v=fNzpcB7ODxQ 2. https://www.youtube.com/watch?v=uHU2uajL1EE 3. https://www.youtube.com/watch?v=K6V7fc5Hj2s 4. https://archive.nptel.ac.in/courses/106/105/106105217/	

USER INTERFACE DESIGN			
Semester	**V**	CIE Marks	**50**
Course Code	**23ISOE312**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives:

1. Impart knowledge of user interface concepts like menus and windows.
2. Understand user interface design in business contexts.
3. Explore UI components, controls, and navigation schemes.
4. Analyze UI design challenges with color, text, and graphics.
5. Examine prototyping and testing methods for UI design.

Module 1: Introduction to User Interface and Design Principles	**No. of Hrs: 8**

The User Interface-Introduction, Overview, The importance of user interface Defining the user interface, The importance of Good design, Characteristics of graphical and web user interfaces, Principles of user interface design.
TextBook-1: Chapter 1, Chapter 2

Module 2: User Interface Design Process and Business Functions	**No. of Hrs: 8**

The User Interface Design process- Obstacles, Usability, Human characteristics in Design, Human Interaction speeds, Business functions-Business definition and requirement analysis, Basic business functions, Design standards.
TextBook-1: Part-2: Step1, Step2

Module 3: System Menus and Navigation Schemes	**No. of Hrs: 8**

System menus and navigation schemes- Structures of menus, Functions of menus, Contents of menus, Formatting of menus, Phrasing the menu, Selecting menu choices, Navigating menus, Kinds of graphical menus.
TextBook-1: Part-2: Step 4

Module 4: Windows Design and Device-Based Controls	**No. of Hrs: 9**

Windows - Characteristics, Components of window, Window presentation styles, Types of window, Window management, Organizing window functions, Window operations, Web systems, Characteristics of device based controls.
TextBook-1: Part-2: Step 5 , step 6

Module 5: Screen-Based Controls and UI Testing Methods	**No. of Hrs: 9**

Screen based controls- Operable control, Text control, Selection control, Custom control, Presentation control, Windows Tests-prototypes, kinds of tests.
TextBook-1: Part-2: Step 7 & Step 14

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

1. **Understand** the importance and principles of effective user interface design.
2. **Apply** the UI design process to develop business-related interface solutions.
3. **Demonstrate** knowledge of menus, navigation schemes, and window components.
4. **Evaluate** and design screen-based and device-based controls with testing techniques.

Textbooks:

1. Wilbert O, Galitz, "**The Essential Guide to User Interface Design**", John Wiley & Sons, Second Edition 2002

Reference Books:

1. Ben Sheiderman, "**Design the User Interface**", Pearson Education, 1998
2. Alan Cooper, "**The Essential of User Interface Design**", Wiley-Dream Tech Ltd.,2002

Web links:

1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/
2. https://www.vtupulse.com/cbcs-cse-notes/17cs832-user-interface-design-uid-notes/
3. https://www.brainkart.com/subject/User-Interface-Design_145/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-831-user-interface-design-and-implementation-spring-2011/lecture-notes/
5. https://lecturenotes.in/download/material/21405-user-interface-design

JAVA PROGRAMMING			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSOE313**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives:

1. Explain key constructs of the Java programming language.
2. Demonstrate object-oriented principles through practical applications.
3. Illustrate packages, multi-threading, and exception handling mechanisms

Module 1: History of Java, Introduction to Java Programming Language	**No. of Hrs: 10**

An Overview of Java: Object-Oriented Programming (OOP) –Two Paradigms: Structured and Object Oriented - Abstraction and OOP Principles: Polymorphism, Inheritance, and Encapsulation. Code Blocks, Lexical Elements - Whitespaces, Identifiers, Literals, Comments, and Separators. The Java Keywords, Data Types, Variables, and Arrays: The Primitive Types - Integers, Floating-Points, Characters and Booleans Variables, Type Conversion and Type Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables, Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, and The Ternary Operator. Operator Precedence, Using Parentheses, Control Statements: Selection Statements - if, if-then-else, nested if-then-else, and switch. Iteration Statements –loop variants: while, do-while, and for. Nested Loops, Jump Statements (break, continue, and return), Local Variable Type Inference
TextBook-1: Chapter 2,3,4 and 5

Module 2: Classes and Methods	**No. of Hrs: 8**

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Methods, Constructors, "this" Keyword, and Garbage Collection, Methods and Classes: Overloading Methods, Argument Passing, Objects as Parameters, Returning Objects, Recursion, Access Control, understanding static and final keywords, Nested and Inner Classes
TextBook-1: Chapter 6 and 7

Module 3: Inheritance and Interfaces	**No. of Hrs: 8**

Inheritance: Inheritance Basics, using super keyword, Types of Inheritance, Multilevel Hierarchy, When and how Constructors Are Executed, Method Overriding, Polymorphism, Dynamic Method Dispatch, Abstract Classes, Using final with Inheritance, The Object Class, **Interfaces:** Definition, Default Interface Methods, Use of static Methods in an Interface, Private Interface Methods
TextBook-1: Chapter 8

Module 4: Packages and Exceptions	**No. of Hrs: 8**

Packages: Packages, Packages and Member Access, Importing Packages
Exceptions: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions
TextBook-1: Chapter 9 and 10

Module 5: Multi-threading, Enumerations, Type Wrappers and Auto-boxing	**No. of Hrs: 8**

Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter-

thread Communication, Obtaining a Thread's State, Enumerations, Type Wrappers and **Autoboxing:** Enumerations - The values() and valueOf() Methods, Type Wrappers - Character, Boolean, The Numeric Type Wrappers Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing of Boolean, Character Values etc.
TextBook-1: Chapter 11 and 12

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

1. **Illustrate** proficiency in creating programs using branching and looping constructs
2. **Develop** a class that encompasses both data attributes and methods tailored to a specific context
3. **Apply** the principles of inheritance and interfaces to address practical challenges in real-world scenarios
4. **Utilize** the concept of packages and exception handling to tackle intricate problems
5. **Develop** programs by integrating concepts such as multithreading, autoboxing, and enumerations

Textbooks:

1. Herbert Schildt "**Java: The Complete Reference**", 12th Edition, McGraw-Hill, 2021

Reference Books:

1. E Balagurusamy, "**Programming with Java**", 6thEdition, by McGraw Hill Education, 2019
2. Bruce Eckel, "**Thinking in Java**", Fourth Edition, Prentice Hall, 2006

Web links:

1. Engineering Java Tutorial: https://www.geeksforgeeks.org/java/
2. Introduction To Programming In Java (by Evan Jones, Adam Marcus and Eugene Wu): https://ocw.mit.edu/courses/6-092-introduction-to-programming-in-java-january-iap-2010/
3. Java Tutorial: https://www.w3schools.com/java/
4. Java Tutorial: https://www.javatpoint.com/java-tutorial

YOGA-III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC321**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Empower students to achieve and maintain good health
2. Promote the practice of mental hygiene
3. Facilitate students in attaining emotional stability
4. Impart moral values and higher level of consciousness

Contents	**No. of Hrs: 13**
• Ashtanga Yoga 1) Asana 2) Pranayama 3) Pratyahara • Suryanamaskar13 count-3 rounds of practice • Asana its meaning by name, technique, precautionary measures and benefits of each asana • Different types of Asanas	
a) Sitting 1) Ardha Ushtrasana 2) Vakrasana 3) Yogamudra in Padmasana	
b) Standing 1) Urdhva Hastothanasana 2) Hastapadasana 3) Parivritta Trikonasana 4) Utkatasana	
c) Prone line 1) Padangushtha Dhanurasana 2) Poorna Bhujangasana	
d) Supine line 1) Sarvangasana 2) Chakraasana 3) Navasana/Noukasana 4) Pavanamuktasana	
• Revision of Kapalabhati practice 30 strokes/min3 rounds • Meaning by name, technique, precautionary measures and benefits of each Pranayama 1) Ujjayi 2) Sheetali 3) Sheektari	

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

1. Describe the meaning, aim and objectives of Yoga
2. Perform Suryanamaskar and able to analyze its benefits
3. Exhibit the different Asanas by name, its importance, methods and benefits
4. Perform Kapalabhati
5. Perform the different types of Pranayama by its name, precautions, procedure and uses

Textbooks:

1. Ajitkumar," **Yoga Pravesha in Kannada**" 1st Edition, Raashtroththaana Saahithya, 2017, ISBN-13: 978-8175310124
2. BKS Iyengar, "**Light on Yoga**", 1st Edition, Thorsons, 2017, ISBN-13: 978-0008267919
3. Dr. M L Gharote & Dr. S K Ganguly, "Teaching Methods for Yogic practices", 1st Edition, Kaivalyadhama, 2001, ISBN-13 : 978-8189485252

Reference Books:

1. Yamini Muthanna, "Yoga for Children step by step", 1st Edition, Om Books International, 2022, ISBN-13: 978-9394547018

Web links:

1. My Life My Yoga , https://youtu.be/KB-TYlgd1wE
2. Adiyoga, https://youtu.be/aa-TG0Wg1Ls

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Quiz	20
2	Practical demonstration	50
3	Final Report	30
	Total	**100**

PHYSICAL EDUCATION-III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC322**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Impart the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Build a strong foundation for the professionals in Physical Education and Sports

Contents:	**No. of Hrs:**
• Ethics in Sports & Moral Values in Sports and Games • Sports Training Methods and its Impacts: Continuous Training, Interval Training, Circuit Training, Weight Training • FITT Implementing FITT principles to design personalized fitness programs. (Lectures & Practical Sessions) • Specific Games (Students continue prior semester's game by practicing Intermediate Skills)	
Basket Ball Crossover dribble - Between-the-legs dribble - Bounce pass and no-look pass Shooting with form from mid-range - Defensive stance and footwork.	
Cricket Advanced batting shots (cover drive, square drive, pull shot) - Swing and seam bowling variations - Fielding positions and strategies - Game sense and awareness.	
Football Shielding the ball - Crossing the ball - Long passing and through balls - Tackling techniques (sliding & standing) - Shooting with power and accuracy - Playing different positions	
Hockey Stickhandling in tight spaces - Slapshot and sweep shot techniques - Passing with speed and accuracy - Dodging defenders - Defensive positioning and checking.	
Kabaddi Advanced raiding techniques (frog jump, jump over) - Diverse raiding holds (frog kick, thigh hold) - Anticipation and countering defense - Effective raiding strategies - Advanced team defense formations.	
Karate Kihon (repetition of basic techniques) - Kata (forms to practice technique and flow) - Combinations of punches and kicks - Footwork and movement - Basic kumite (sparring) techniques.	
Table Tennis Looping technique (forehand and backhand) - Topspin and backspin serves - Footwork for attacking and defense - Blocking and countering techniques - Match strategy and tactics.	
Throwball Long throws and bounce passes - Fake passes and deception moves - Dodging techniques to create space - Defensive positioning and guarding techniques - Team offense and set plays	
Volleyball Attack, Block, Service, Upper Hand Pass and Lower hand Pass	

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

1. **Develop** strategies to promote ethical conduct and a positive sporting culture
2. **Understand** the importance of ethics and moral values in sports and games
3. **Perform** in the selected sports or athletic events.

Textbooks:

1. Muller, J. P., "**Health, Exercise and Fitness**", 1st Edition, Sports Publication, 2018
2. Uppal, A.K., **"Physical Fitness"**, Friends Publication New Delhi, 1992
3. Russell R.P., **"Health & Fitness through Physical Education: Human Kinematics",** Human Kinetics Publishers, 1994

Reference Books:

1. Anaika , "**Play Field Manual**", Friends Publication New Delhi, 2005
2. IAAF Manual
3. Pinto John & Roshan Kumar Shetty, "**Introduction to Physical Education**"

Web links:

1. https://www.youtube.com/watch?v=wvlztaJYKYI
2. https://www.youtube.com/playlist?list=PLHCNPOIaj2Wc8P5xAWq9g2DUrrbixoTOK
3. https://www.youtube.com/watch?v=K9X_wB1Yu84
4. https://www.youtube.com/watch?v=HEHggOOds1w&list=PLgVaM7Baa_8myp4njEDco__YyZkBq-542S5

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Participation of students	20
2	Quizzes-2, each of 15 marks	30
3	Final presentation/Exhibition/Participation in Competitions (Certificate of participation in National/International)	50
	Total	**100**

NATIONAL SERVICE SCHEME (NSS) -III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC323**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens
2. Develop youth leadership in the students
3. Induce social consciousness among students through various societal activities
4. Impart knowledge in finding practical solutions to individual and community problems

Contents:	**No. of Hrs:**

Introduction:

- Promoting a healthy lifestyle among youth
- Nutrition education, stress management and mental health activities

Activities:

- Village awareness programs on women hygiene, various superstitious beliefs, avoiding self-medication, etc
- Helping local schools to achieve good results and enhance their enrolment in Higher/technical/ vocational education

Note:

- Students in individual or in a group should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department
- At the end of every semester, activity report should be submitted for evaluation

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

1. **Understand** the importance of nation building and individual contribbution to the betterment of the society
2. **Discover** grassroots challenges of community and solve them by technological intervention
3. **Create** societal impact by upholding the value of one for all and all for one
4. **Maintain** discipline and team spirit

Textbooks:

1. "**National Service Scheme Manual**", Ministry of Youth Affairs & Sports, Government of India, 2022
2. "**Introduction Training Module for National Service Scheme (NSS) Program officers**", Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs & Sports, Government of India, 2017
3. Gurmeet Hans, "**Case material as Training Aid for field workers**" TISS, 1996

Reference Books:

1. Dr. G R Bannerjee, **Social service opportunities in Hospitals**, TISS, 2012
2. Ram Ahuja, **Social Problems in India**, Rawat publications, 3rd Edition, 2014

Web links:

1. History of NSS https://thebetterindia.com/140/national-service-scheme-nss/
2. NSS – an introduction https://www.youtube.com/@nationalserviceschemeoffic4034/videos

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Participation of students	30
2	Individual contribution to success of the program	40
3	Report preparation	30
	Total	**100**

ARTS -III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC324**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Impart an understanding of the creative process from initial concept to final execution.
2. Create and demonstrate proficiency in a chosen arts discipline through practical application
3. Analyze and appreciate diverse art forms and styles
4. To participate in art competitions at regional, state, national, and international levels, as well as in cultural events

Contents:	**No. of Hrs: 13**
Note: Student will continue the arts form selected in previous semester.	
Performing Arts (Dance)	Orientation, Cinema Acting Basics, Facial Expression Exercises, Body Language, Camera Angles, Characterization demo and Practice, Individual Presentations, Evaluation.
Arts & Crafts	Orientation, Craft Forms, Paper Craft, Mask Making, Model Making, Thermocol Art, Finger Puppet Making, Group Presentation, Evaluation.
Theatre	Orientation, Introduction to Theatre Sets and properties, Practical use of properties, Set Designing, Costume Design, Headgears and Masks, Theatre Makeup, Evaluation.

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

1. Capable of creating choreography and delivering live performances for an audience.
2. Employ a range of acting techniques and use them to create a performance.
3. Evolve into creative, effective, independent, and reflective individuals capable of making informed decisions in both process and performance.
4. Acquire knowledge and comprehension of the roles and processes used in current theatre arts practice.

Textbooks:

1. **Music in Theory and Practice** by Bruce Benward and Marilyn Sake, McGraw-Hill Education,2014
2. **Art Fundamentals: Theory and Practice** by Otto G. Ocvirk, Robert E. Stinson, Philip R. Wigg, Robert Bone, and David L. Cayton, McGraw-Hill Education,2012
3. **The Viewpoints Book: A Practical Guide to Viewpoints and Composition** by Anne Bogart and Tina Landau, Theatre Communications Group,2004

Reference Books:

1. **Dance Composition: A practical guide to creative success in dance making**, Jacqueline M. Smith
2. **The Artist,s handbook of method and materials** by Ralph Mayer
3. **Glimpses of Indian Music and Dance** by Dr. Arun Bangre.

Web links:

1. https://ccrtindia.gov.in/audio-visual-catalogue/

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Students Participation	20
2	Quizzes-2 (each of 15 marks)	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**

BUSINESS INTELLIGENCE			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPC306**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives:

1. Provide the importance of Business Intelligence (BI) in decision making.
2. Impart knowledge on the evolution of the field of BI and analytics from decision support systems to prescriptive analytics.
3. Present the emerging trends in BI and its applications.

Module 1: Introduction	**No. of Hrs: 8**

Business Intelligence(BI) and Information Exploitation, Values of BI, Framework for Computerized Decision Support, The Concept of Decision Support Systems (DSS),A Framework forBI, Business Analytics Overview, Decision Support Systems: Capabilities and Classifications, Components of Decision Support Systems.
Text Book 1: Chapter 1, 2
Text Book 2: Chapter 1.5, 1.6, 1.7, 1.8 , Chapter 2.9,2.11

Module 2: Descriptive Analytics	**No. of Hrs: 8**

Data Warehousing: Definitions and Concepts, Data Warehousing Process Overview, Data Integration and Extraction, Transformation and Load (ETL) Processes, Data Representation and Analysis in Data Warehousing.
Business Reporting: Definitions and Concepts, Different types of Charts and Graphs, Emergence of Visual Data Analytics, Performance Measurement, Balanced Scorecards, Six Sigma Performance Metrics
Text Book 2: Chapter 3.2, 3.4, 3.5, 3.6 Chapter 4.2, 4.4, 4.5, 4.8, 4.9, 4.10

Module 3: Predictive Analytics	**No. of Hrs: 9**

Data Mining Basics. Data Mining Process, Neural Network Concepts and Implementation, Text Analytics & Mining Basics, Natural Language Processing, Text Mining Process, Sentiment Analysis Overview, Web Content and Web Structure Mining, Search Engines, Web Usage Mining, Web Analytics Maturity Model and Tools, Social Network Analysis.
Text Book 2: Chapter 5:5.4, Chapter 6:6,2,6.3,6.6, Chapter 7: 7.2,7.3, 7.5, 7.7, 7.9
Chapter 8: 8.3, 8.4,8.6,8.7,8.10

Module 4: Prescriptive Analytics	**No. of Hrs: 9**

Decision Support Systems Modeling, Mathematical Models for Decision Support, Certainty, Uncertainty, and Risk, Multi-Goal Decision Strategy, Decision Analysis: Tables & Trees, Problem-Solving Search Methods, Genetic Algorithms Concepts, Agent-Based Modeling.
Text Book 2: Chapter 9.2.9.3,9.4,9.7,9.8, Chapter 10.2,10.3,10.7

Module 5: Expert Systems and Emerging Trends	**No. of Hrs: 8**

Basic Concepts of Expert Systems, Structure of Expert Systems, Development of Expert Systems, Knowledge Engineering, Problem Areas for Expert System, Development of Expert Systems, Knowledge Management Overview, Approaches to Knowledge Management, Knowledge Management System Cycle, Stream Analytics, Location Based Analytics for Organizations, Recommendation Engines, Cloud Computing and BI, Issues of Legality, Privacy and Ethics
Text Book 2: Chapter 11.4,11.6,11.7,11.8,11.9, Chapter 12.2,12.3,12.4, Chapter 13.8,
Chapter 14:14.3,14.4,14.6,14.7

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

1. **Explain** the business intelligence concepts, importance of analytics in decision making for BI applications and the emerging trends of BI.
2. **Discuss** the concepts and techniques for decision support systems, descriptive, predictive and prescriptive analytics for business intelligence.
3. **Illustrate** the process of descriptive analytics and data Visualization for making informed decisions.
4. **Apply** the techniques of Predictive and prescriptive analytics for BI applications.

Textbooks:

1. David Loshin, "**Business Intelligence – The Savvy Manager's Guide**", Morgan Kaufmann Publishers, Copyright 2003, Elsevier
2. Ramesh Sharda, Dursun Delen, Efraim Turban, J. E. Aronson, Ting-Peng Liang, David King, "**Business Intelligence and Analytics: System for Decision Support**", 10th Edition, Pearson Global Edition, 2013

Reference Books:

1. Data Analytics: The Ultimate Beginner's Guide to Data Analytics Paperback – 12 November 2017 by Edward Mize
2. Elizabeth Vitt, Michael Luckevich, Stacia Misner (2010). "Business Intelligence". O'Reilly Media, Inc.

Web links:

1. Business Intelligence & Analytics: https://onlinecourses.nptel.ac.in/noc24_cs65/preview
2. Business Analytics & Business Intelligence Full Course 2022 | Business Analysis | Simplilearn: https://www.youtube.com/watch?v=zbcCdoHeS4w

SYSTEM ENGINEERING			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPC307**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**2:0:0**	Exam Hrs	**03**
Total Hrs	**26**	Credits	**2**

Course Learning Objectives:

1. Impart knowledge on physical design principles, materials, sensor-actuator interfacing, communication protocols, and power management techniques.
2. Provide data modeling and storage methods for managing sensor and actuator data in physical systems.
3. Disseminate knowledge on user-centric interfaces and dashboards using UI/UX principles to meet business and system requirements.
4. Impart knowledge on scalability strategies and load balancing techniques to design efficient and scalable physical systems.

Module 1: Physical Design	**No. of Hrs: 6**

Understanding the basic principles and importance of physical design in engineering. Design Process: Steps involved in the physical design process. Materials and Components: Types of materials and components used in physical design.

Sensors, Actuators, Integrating Sensors and Actuators: Interfacing Sensors with Microcontrollers, Interfacing Actuators with Microcontrollers, Communication Protocols: I2C, SPI, UART, and CAN for sensor and actuator integration. Power Management: Power requirements and management for sensors and actuators. Case Studies: Use of sensors and actuators in automation.

Module 2: Data Model Design	**No. of Hrs: 5**

Data Store Concepts: Relational databases, NoSQL databases, file-based storage. Storage Technologies: SSDs, HDDs, cloud storage, in-memory databases. Data Store Selection, Design of EER Models. Data Requirements in Physical Systems, Sensor Data Management: Designing data models for sensor data storage and retrieval. Actuator Control Data: Modeling data for actuator control and feedback. Real-time Data Processing: Techniques for handling real-time data in physical systems. Case study (Example: Design EER Model for a Smart Home System).

Module 3: Interface design	**No. of Hrs: 5**

Overview of UI/UX design: definition and importance, Hardware User interface(HUI), roles and responsibilities in UI/UX, Importance of UI/UX in system design, integration of UI/UX with system architecture. Introduction to dash board design: types of dash boards (operational, analytical, and strategic), effective dashboard design. Designing for business values: identifying business KPIs-custom dash board design for business goals, creating value driven dash board, measuring impact of dashboard design.

Module 4: Scalability	**No. of Hrs: 5**

Introduction to scalability, types of scalability-vertical and horizontal. Principle of scalable system design: design principles, architectural pattern. Load balancing: types of load balancing. Database scalability: scaling databases, sharding, and replication. Distributed systems: CAP theorem, Monitoring and performance tuning.

Module 5: Case studies	**No. of Hrs: 5**

Case studies for system design such as Smart city traffic management system-real time data collection and processing, scalability, data storage and management, analytics and reporting and user interface. Netflix- Global scale streaming. Amazon- scalable E-commerce platform. Scalable

environment monitoring system, Scalable health care monitoring system, Scalable agricultural monitoring systems etc.

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

1. **Explain** physical design principles, materials, sensor-actuator integration, communication protocols, and power management techniques
2. **Apply** data modeling and storage techniques suitable for physical systems and sensor-actuator integration
3. **Apply** UI/UX and dashboard design principles to build interfaces for business and system needs.
4. **Apply** scalability and load balancing concepts to design scalable physical systems.

Textbooks:

Reference Books:

1. Raj Kamal, **Embedded Systems: A Comprehensive Guide to Embedded Systems and Computer Engineering**" , 4th Edition, 2020.
2. Martin Kleppmann , **Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems**, O'REIlY publication,2017
3. Rex Hartson, Pardha S. Pyla, **The UX Book: Agile UX Design for a Quality User Experience**, 2019.

Web links:

BUSINESS INTELLIGENCE LAB			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPC308**	SEE Marks	**50**
Teaching Hrs/Week (L: T: P)	**0:1:3**	Exam Hrs	**03**
Total Hrs	**13+36**	Credits	**02**

Course Learning Objectives: This course is designed to

1. Provide insights on implementing Decision Support Systems (DSS) using descriptive, predictive, and prescriptive analytics to enhance decision-making for business solutions.
2. Impart knowledge on applying clustering, optimization, and recommendation techniques to develop data-driven solutions that support decision-making.
3. Provide hands-on experience in building efficient data-driven solutions for feature selection, cloud-based analytics, and real-time data stream processing under limited resources.

Module 1: Introduction to Business Intelligence Tools — **No. of Hrs: 13**

Data retrieval and visualization using MySQL and Pandas, Exploratory Data Analysis (EDA) in Python, ETL (Extraction, Transformation, and Load) Processes: Data extraction using MySQL, Data transformation using Python (Pandas, NumPy), Loading processed data into a warehouse.

Web scraping using BeautifulSoup and Scrapy, Sentiment Classification Using VADER, TextBlob, Data Collection from social media

Using Twitter API, IMDb, YouTube comments API, Recommendation System Approaches: Collaborative Filtering vs. Content-Based Filtering, Building recommendation models with Scikit-learn and Surprise library

Using Firebase Firestore and Google Colab, BI Dashboard Creation, Google Data Studio, Hosting dashboards using GitHub Pages and Google Drive.

Laboratory Component: — **No. of Hrs: 36**

1. A retail company wants to analyze customer purchase trends, predict future sales, and provide recommendations for increasing customer engagement and revenue. The company needs a Decision Support System (DSS) that can:
   - Summarize customer purchase data (Descriptive Analytics)
   - Predict future sales trends based on historical patterns (Predictive Analytics)
   - Recommend business strategies for customer retention and revenue growth (Prescriptive Analytics)

   Hint :Use MySQL and Python
2. Design and implement a data warehouse for a retail business, apply ETL (Extraction, Transformation, and Load) processes, perform OLAP operations, and generate business performance reports using Python and MySQL.

3. A movie production company wants to understand how audiences feel about a new movie based on social media discussions and reviews. To achieve this, the company aims to:
   - Collect social media posts and reviews related to the movie.
   - Analyze sentiment to determine public opinion.
   - Identify trending hashtags and discussions around the movie.
   - Visualize insights using graphs and word clouds.

   Hint:Use Twitter API, IMDb, Rotten Tomatoes, or YouTube comments API to collect movie reviews and discussions. Clean the text by removing special characters, stopwords, and emojis.

4. A healthcare organization wants to analyze online patient feedback, medical articles, and web traffic to improve services and provide better patient care. To achieve this, the organization aims to:
   - Extract health-related web content from medical websites and forums.
   - Analyze web structure to understand link connections in healthcare networks.
   - Study web usage patterns to track patient searches and appointment trends.
   - Visualize insights using dashboards and graphs for decision-making

   Hint:Scrape health-related websites (e.g., WHO, medical forums, hospital websites) using BeautifulSoup/Scrapy.

5. Develop an AI-powered system that automates resume screening using NLP to extract attributes like skills, experience, and qualifications. Apply rule-based filters for initial selection and use a neural network model trained on labeled resumes to classify candidates into shortlisted, rejected, or under review.

6. Implement a Kohonen Self-Organizing Map (SOM) to perform unsupervised clustering on a high-dimensional synthetic dataset. The objective is to:
   - Reduce the dimensionality of the dataset while preserving the topological relationships between the data points.
   - Discover natural clusters within the data without relying on predefined labels.
   - Visualize the clustering results by mapping similar data points to adjacent neurons in the 2D SOM grid.

   Dataset Generation: Generate a synthetic dataset with the following characteristics:
   - Number of samples: 1000
   - Number of features: 5 (high-dimensional space)
   - Number of clusters: 3

7. Design and implement a Python-based Decision Support System (DSS) that uses a **Hopfield Neural Network** to model and optimize a ₹60,000 monthly budget while satisfying multiple financial goals. The system should adopt a **multi-goal decision strategy** to handle constraints and provide intelligent recommendations.

   Financial Goals:
   - Save ≥ 20% of income
   - Spend ≤ 30% on rent/utilities
   - Allocate ≥ ₹5,000 to health/wellness
   - Spend ≥ ₹3,000 on entertainment

   Expense Categories:
   - Rent & Utilities, Groceries, Transportation, Health & Wellness, Entertainment, Savings, Miscellaneous

Task	Description
Model Budget Plan	- Define variables/functions for each category.
	- Validate that allocations meet financial goals.
	- Use a Hopfield Network energy function to model constraints and minimize violations.
What-If Analysis	- Generate multiple budget scenarios using random or guided simulations.
	- Visualize valid outcomes using bar charts and pie charts with matplotlib or seaborn.
Sensitivity Analysis	- Analyze how variations in Groceries and Transportation affect Savings.
	- Visualize impact using line/scatter plots to reveal sensitivity and thresholds.
Goal-Seeking	- Apply Hopfield-inspired optimization to maximize Entertainment spending.
	- Ensure that Savings ≥ 20% and all other constraints are still satisfied.
Recommendations	- Suggest an optimized budget configuration that meets all goals.
	- Use visual summaries (e.g., dashboards, charts) to present a clear financial plan.

8. An e-commerce platform wants to enhance customer experience by providing personalized product recommendations. The system should:
   - Analyze past purchase and browsing history to understand customer preferences.
   - Implement recommendation models (collaborative filtering or content-based filtering).
   - Provide relevant product suggestions to increase customer engagement and sales.

9. Given a dataset with multiple features, implement a **Genetic Algorithm** (GA) to select the most relevant features for a classification model (e.g., Decision Tree, SVM) that maximizes model accuracy based on the tasks given below.
   a) Represent each feature subset as a **chromosome** (binary vector where 1 indicates inclusion and 0 indicates exclusion of features).
   b) Define a **fitness function** based on the **model accuracy** (higher accuracy means higher fitness).
   c) Apply **selection, crossover**, and **mutation** to evolve the feature subsets.
   d) Train the classification model using the selected features and evaluate its **accuracy**.
   e) Output the **best feature subset** and the **corresponding accuracy**.
   f) Visualize the **accuracy evolution** across generations.

10. A small business seeks to leverage cloud-based Business Intelligence (BI) solutions to analyze sales trends and customer behaviour without incurring costs for paid tools. The objectives include:
    - Utilizing a free cloud database, such as Firebase Firestore, for storing and managing data.
    - Performing data analytics and processing through free tools like Google Colab.
    - Building an interactive BI dashboard using Google Data Studio for visualizing insights.
    - Hosting data and dashboards using platforms like Google Drive and GitHub Pages.

11. Simulate a real-time data stream (e.g., sensor readings or network traffic values) and develop a simple stream mining model that continuously analyzes incoming data to detect significant patterns or anomalies.
    Hint: Simulating a Data Stream, Anomaly Injection: Add occasional spikes to simulate unusual data.

12. A leading medical college is expanding its campus facilities. The task is to analyze potential new site locations using spatial and demographic data.
    Given:
    - Existing campus locations and enrolment data.
    - A list of potential new site coordinates.
    - Demographic data for each location (population, income, and age distribution).

    Based on the above information implement the following to do the following:
    - Identify new sites at least 100 km away from existing campuses.
    - Match demographic profiles of potential locations with those of high-performing campuses.
    - Recommend the best locations for new campus expansion.

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

1. Implement techniques for Decision Support Systems using descriptive, predictive, and prescriptive analytics to support business intelligence and informed decision-making.
2. Develop data-driven solutions using clustering, optimization, and recommendation techniques to support decision-making and improve user experience.
3. Build smart data-driven solutions for feature selection, cloud analytics, and real-time data processing.

Textbooks:

1. Learning MySQL by M.M. Tahaghoghi, Hugh Williams Publisher: O'Reilly Media , 2020
2. Python for Data Analysis (3rd Edition) by Wes McKinney. O'Reilly Media
3. Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit,1st Edition, 2009 by Steven Bird, Ewan Klein, and Edward Loper,O'Reilly Media.

Reference Books:

1. Hands-On Recommendation Systems with Python (1st Edition, 2018) by Rounak Banik, published by Packt Publishing.
2. Google Data Studio for Beginners by Grant Kemp& Gerry White,Apree Publisher,2021 edition.

Web links:

1. https://pytorch.org/tutorials/beginner/colab.html
2. https://firebase.google.com/docs/firestore

PROJECT PHASE – I			
Semester	**VI**	CIE Marks	**100**
Course Code	**23ISSE309**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:6**	Exam Hrs	**-**
Total Hrs		Credits	**3**

Objectives:

1. To develop the students' ability to independently or collaboratively identify a problem, review literature, define objectives, and propose a preliminary methodology for solving an engineering problem, which will be realized in Project Phase – II.
2. The course also aims to develop leadership and interpersonal communication skills within team members.

General Guidelines:

1. A project guide (faculty member) will be allocated by the department
2. The HoD shall appoint a project coordinator who will take the responsibility of monitoring all the activities related to the project execution.
3. The HoD shall constitute project evaluation/review committee(s) & the composition shall be as follows:
    a. HOD or one of the HODs in case of an interdisciplinary project, shall be the Chairman of the committee
    b. Project Coordinator shall be member - Convener
    c. Project guide shall be the member
    d. One/Two senior faculty members nominated by the HOD (may be from different departments in case of an interdisciplinary project jointly nominated by the HODs)
4. Each project team shall consist of 2 to 4 students from the same department or different departments.
5. Interdisciplinary projects may be allowed with prior approval from the concerned HODs only.
6. Project teams must arrive at problem statements that address either real-world challenges or research-related issues relevant to their domain of study. Each team must formulate an appropriate project title in consultation with their project guide.
7. Each project team shall maintain a project dairy and record their project progress at regular interval of time. This shall carry signature of the students and the project guide.
8. There is no Semester End Examination (SEE) for this course and evaluation is based entirely on Continuous Internal Evaluation (CIE)
9. Marks may be equally or proportionally distributed among team members based on contribution assessed by the guide and committee.
10. A student shall obtain minimum of 40% of the total marks to pass this course
11. Plagiarism, data fabrication, or copying of work will result in stringent disciplinary action and /or penalties. (Note: Any disciplinary actions or penalties will be as per institutional policy.)

Deliverables:

1. Comprehensive Project Report comprising of:
   - Abstract
   - Introduction
   - Literature Survey
   - Problem Definition
   - Proposed Methodology
   - Design
   - Summary and Work Plan for Phase-II
   - References
   - Appendices

The project report shall be prepared in the prescribed format provided by the institute.

2. A plagiarism report shall be obtained from the Department of Library. Acceptable similarity threshold is generally below 20%, and hence, the plagiarized content shall not exceed 20%. Similarity above 20% will require resubmission after proper revisions.

Review and Evaluation:

1. There shall be two reviews and a presentation. Total of 100 CIE marks is distributed as follows:

Review - 1	
Topic approval, Problem Definition & Objectives	20 Marks
Literature Review	10 Marks
Innovation/Novelty	10 Marks
Total	**40 Marks**

Review - 2	
Methodology & Design	15 Marks
Report Quality & Formatting	15 Marks
Total	**30 Marks**

Presentation	
Presentation	20 Marks
Team work	10 Marks
Total	**30 Marks**

Grand Total	**100 Marks**

2. First review shall be conducted after one month from the start of the semester.
3. Further, every department shall develop rubrics to assess performance of the students based on the above given parameters

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

CO1. Identify an engineering or research problem through a thorough review of relevant literature.

CO2. Design an appropriate solution or methodology to address the identified problem.

CO3. Prepare a comprehensive project report.

CO4. Effectively present each component of the project report to a knowledgeable audience.

CO5. Collaborate and contribute effectively as a team member, recognizing the dynamics of both individual and group work.

CLOUD COMPUTING			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPC310**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**2:0:0**	Exam Hrs	**2.5**
Total Hrs	**26**	Credits	**2**

Course Learning Objectives: This course is designed to

1. Impart the knowledge of cloud computing revolution and the business drivers
2. Provide comprehensive understanding of virtualization and various models of cloud computing
3. Impart the importance of Cloud security
4. Provide insights into the industrial cloud platforms and its native applications.

Module 1: Introduction to Cloud Computing	**No. of Hrs: 4**

Introduction ,Cloud Computing at a Glance, Historical Developments, Building Cloud Computing Environments, Cloud computing platforms and technologies: Amazon Web Services (AWS), Google App Engine, Microsoft Azure, Hadoop

Text Book 1: Chapter 1: 1.1 to 1.4.

Module 2: Virtualization	**No. of Hrs: 6**

Introduction, Characteristics of Virtualized environments, Taxonomy of Virtualization Techniques: Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples: Xen: para virtualization, VMware Full virtualization.

Text Book 1: Chapter 3: 3.1 to 3.6.

Module 3: Cloud Computing Architecture	**No. of Hrs: 4**

Introduction, Cloud Reference Model, architecture, Infrastructure as a service, platform as a service, software as a service, Types of Clouds: Public, Private, Hybrid and Community clouds. Economics of the Cloud, Open Challenges.

Text Book 1: Chapter 4: 4.1 to 4.5

Module 4: Cloud Security	**No. of Hrs: 6**

Cloud Security Risks, Top concern for cloud users, privacy and privacy impact assessment, trust, OS security, VM Security, Security of virtualization, Security risks posed by shared images

Text Book 2: Chapter 9: 9.1 to 9.8

Module 5: Cloud Platform in Industry and Cloud Applications	**No. of Hrs: 6**

Amazon web services: - Compute services, Storage services, Communication services, Additional services. Google App Engine: - Architecture and core concepts, Application life cycle, Cost model, Observations, Microsoft Azure: Azure core concepts, SQL Azure, Windows Azure Platform Appliance

Text Book 1: Chapter 9: 9.1 to 9.3

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

1. **Understand** and analyze various cloud computing platforms and service provider.
2. **Illustrate** various virtualization concepts and classify virtualization techniques.
3. **Identify** the architecture, infrastructure and delivery models of cloud computing.
4. **Demonstrate** the importance of the security aspects in cloud and platforms for development of cloud applications

Textbooks:

1. Rajkumar Buyya, Christian Vecchiola, and Thamrai Selvi Mastering Cloud Computing McGraw Hill Education.
2. Dan C. Marinescu, Cloud Computing Theory and Practice, Morgan Kaufmann, Elsevier 2013

Reference Books:

1. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media.
2. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication.
3. John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises,

Web links:

1. https://www.youtube.com/watch?v=1N3oqYhzHv4
2. https://www.youtube.com/watch?v=RWgW-CgdIk0

CRYPTOGRAPHY & NETWORK SECURITY			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPE321**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

1. Provide basics of Cryptography concepts, Security and its principle
2. Impart knowledge on public and private key cryptography
3. Impart knowledge on key distribution scenario and certification
4. Impart knowledge on the approaches and techniques to build protection mechanism to secure computer networks

Module 1: Encryption Techniques	**No. of Hrs: 8**

A model for Network Security, Classical encryption techniques: Symmetric cipher model, Substitution ciphers-Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Ciphers, One time pad, Steganography. Block Ciphers and Data Encryption Standards: Traditional Block Cipher structures, data Encryption Standard (DES), A DES Example, The strength of DES, Block cipher design principles.

Text Book 1: Chapter 1: 1.8 Chapter 3: 3.1, 3.2, 3.5 Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.5

Module 2: Public key cryptography	**No. of Hrs: 9**

Pseudorandom number Generators: Linear Congruential Generators, Blum Blum Shub Generator. Public key cryptography and RSA: Principles of public key cryptosystems-Public key cryptosystems, Applications for public key cryptosystems, Requirements for public key cryptography, Public key Cryptanalysis, The RSA algorithm: Description of the Algorithm, Computational aspects, The Security of RSA. Diffie-Hellman key exchange: The Algorithm, Key exchange Protocols, Man-in-the-middle Attack, Elliptic Curve Cryptography: Analog of Diffie-Hellman key Exchange, Elliptic Curve Encryption/Decryption, Security of Elliptic Curve Cryptography

Text Book 1: Chapter 8: 8.2 Chapter 9: 9.1, 9.2 Chapter 10: 10.1, 10.4

Module 3: Hash functions, Key management and distributions	**No. of Hrs: 8**

Applications of Cryptographic Hash functions, Two simple Hash functions, Key management and distribution: Symmetric key distribution using symmetric encryption, Symmetric key distribution using asymmetric encryption, Distribution of public keys, X.509 Certificates, Public Key Infrastructures

Text Book 1: Chapter 11: 11.1, 11.2 Chapter 14: 14.1, 14.2, 14.3, 14.4, 14.5

Module 4: User Authentication and E-mail security	**No. of Hrs: 9**

User Authentication: Remote user authentication principles, Kerberos, Remote user authentication using asymmetric encryption. Web security consideration, Transport layer security. Email Threats and comprehensive email security, S/MIME, Pretty Good Privacy.

Text Book 1: Chapter 15: 15.1, 15.3, 15.4 Chapter 17: 17.1, 17.2 Chapter 19: 19.3, 19.4, 19.5

Module 5: IP Security	**No. of Hrs: 8**

IP Security: IP Security overview, IP Security Policy, Encapsulating Security Payload, Combining security associations, Internet key exchange.

Text Book 1: Chapter 20: 20.1, 20.2, 20.3, 20.4, 20.5

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

1. Explain the basic concepts of Cryptography and Security aspects
2. Apply different Cryptographic Algorithms for different applications
3. Describe methods for authentication and access control.
4. Describe key management, key distribution and Certificates for network security.
5. Describe Electronic mail and IP Security.

Textbooks:

1. William stallings, "Cryptography and Network Security", Pearson Publication, Seventh Edition.

Reference Books:

1. Keith M Martin, "Everyday Cryptography", Oxford University Press
2. V.K Pachghare,"Cryptography and Network Security", PHI, 2nd Edition

Web links:

1. Full NPTEL course: https://archive.nptel.ac.in/courses/106/105/106105031/
2. Full NPTEL course: https://nptel.ac.in/courses/106105162

SOFTWARE TESTING			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPE322**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives: This course is designed to

1. Impart knowledge on basics of software testing
2. Provide insights into building test cases for a given application.
3. Provide knowledge on effective test planning.
4. Impart knowledge on automated testing process and tools.
5. Provide insights into test metrics to accomplish testing quality.

Module 1: Basics of Software Testing	**No. of Hrs: : 8**

Introduction: Approaches to testing, Popular Definitions of testing, Testing during development life cycle, Essentials of Testing, Workbench, Important features of testing process, Salient features of good testing, Test planning, Test team approach, Process problems faced by testing, Cost aspect of testing, Testing process, Testing methodologies, Skills required by tester.

Text Book 1: Chapter 3: 3.1, 3.4. 3.5, 3.6, 3.8, 3.9, 3.10, 3.13, 3.16, 3.21, 3.22, 3.23, 3.31, 3.33, 3.36

Module 2: Functional Testing	**No. of Hrs: 9**

Boundary value testing: Robust Boundary value testing, Worst-case Boundary value testing, Test cases for the example problem, Guidelines for Boundary value testing.

Equivalence class testing: Improved Equivalence class testing, Test cases for the example problem, Guidelines and observations.

Text Book 2: Chapter 5: 5.1, 5.2, 5.3, 5.5, 5.7 Chapter 6: 6.1, 6.3, 6.4, 6.8

Module 3: Structural Testing	**No. of Hrs: 9**

Path Testing: Program Graphs, DD paths, Basis path testing, Guidelines and observations.

Data –Flow testing: Definition-Use testing, Slice based testing, Program slicing tools.

Text Book 2: Chapter 8 :8.1, 8.2, 8.4, 8.5 Chapter 9: 9.1, 9.2, 9.3

Module 4: Testing Tools and Special Tests	**No. of Hrs: 8**

Testing Tools: Features of test tool, Guidelines for selecting a tool, Static testing tools, Dynamic testing tools, when to use automated testing tools, Testing process using automated tools.

Special Tests: Object oriented application testing, COTS testing, Client-Server testing, Web application testing, Mobile application testing, eCommerce testing.

Text Book 1: Chapter12: 12.5, 12.7, 12.8, 12.9, 12.10, 12.11 Chapter 13: 13.2, 13.3, 13.5, 13.6, 13.9, 13.10

Module 5: Test Planning and Metrics	**No. of Hrs: 8**

Test Planning: Content of test policy, Content of test strategy, Test plan, Test plan template, Building test data and test cases, Teat scenario, Test cases, Test management software, Generation of test data.

Test Metrics: Introduction, Categories of Product/project test metrics, Resources consumed in testing, Effectiveness of testing.

Text Book 1: Chapter14: 14.3, 14.5, 14.10, 14.15, 14.16, 14.17, 14.21, 14.26 Chapter15:15.1, 15.5, 15.7, 15.8

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

1. Describe the basic concepts of software testing.
2. Write well-structured test cases based on software requirements and specifications.
3. Design different activities involved in test planning.
4. Implement automated and manual test processes using industry-standard software testing tools.
5. Apply the concepts of metrics to assess the testing methods

Textbooks:

1. M G Limaye, "Software Testing Principles, Techniques and Tools", Tata McGraw Hill,2012.
2. Paul C. Jorgensen, "Software Testing, A Craftsman's Approach", 4th Edition, Auerbach Publications, 2014

Reference Books:

1. Elfriede Dustin, "Effective Software Testing" Pearson Education, 2007.
2. Aditya P Mathur: Foundations of Software Testing, Pearson Education, 2008.
3. Unmesh Gundecha, Satya Avasarala, "Selenium Web Driver 3 Practical Guide"–SecondEdition2018

Activities/Assignments:

Develop a Mini Project with documentation of suitable test-cases and their results to perform automation testing of any E-commerce or social media web page using Selenium or Katalon

Web links:

1. Software Testing Course, IIT, Kharagpur https://nptel.ac.in/courses/106/105/106105150/
2. Software Testing Course, NPTEL https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. Software Testing Course, IIT, Madras https://www.youtube.com/watch?v=OGImfxO2TEU&t=10s
4. Lecture series on Software Testing https://www.youtube.com/watch?v=Q50ZyydS7pI

COMPILER DESIGN			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ISPE323**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

1. Provide fundamental knowledge of language translators
2. Impart knowledge on lexical analysis and parsing techniques
3. Impart knowledge on action carried out in semantic analysis
4. Provide knowledge on the intermediate code generation
5. Provide knowledge on code optimization and code generation

Module 1: Introduction to compilation and lexical analysis	**No. of Hrs: 8**

Language Processors, Structure of a compiler, Lexical analyzer: Tokens, Patterns and lexemes, Attributes of tokens. Input buffering, Specification of tokens, Recognition of tokens. The lexical analyzer – Lex.

Text Book 1: Chapter 1.1, 1.2, 3.1, 3.2, 3.3, 3.4,3.5

Module 2: Syntax Analysis	**No. of Hrs: 9**

Introduction, Syntax Specification using grammar, Writing a grammar, Top-down parsing, Bottom up parsing, LR parsing: Simple L R parsing, Canonical T R parsing: LR(1) and LALR parsing. Parser Generator- YACC

Text Book 1: Chapter 4.1, 4.2, 4.3, 4.4, 4.5,4.6,4.7,4.9

Module 3: Semantic Analysis	**No. of Hrs: 8**

Syntax Directed Definition(SDD), Evaluation order for SDDs, Application of syntax directed translation(SDT), SDT schemes, Implementing L-attributed SDDs

Text Book 1: Chapter 5.1,5.2,5.3,5.4,5.5

Module 4: Intermediate Code Generation	**No. of Hrs: 9**

Variants of syntax trees, Three address code, Translation of expressions, Control flow, Backpatching, Switch statements

Text Book 1: Chapter 6.1, 6.2, 6.4, 6.6, 6.7, 6.8.

Module 5: Code optimization and Code generation	**No. of Hrs: 8**

Issues in code generator, Target language, Basic blocks and flow graphs, optimization of basic blocks, A simple code generator, peephole optimization.

Chapter 8.1, 8.2, 8.4,8.5, 8.6, 8.7

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

1. Illustrate language processing and phases of compilers
2. Apply lexical analysis and semantic analysis methods for the construction of a compiler
3. Apply Syntax analysis methods to develop a parser
4. Develop intermediate codes for language constructs
5. Apply code optimization techniques to generate the optimized target code

Textbooks:

1. Aho, Sethi, and Ullman, "Compilers: Principles, Techniques, and Tools", 2nd Edition, Addison-Wesley,2011

Reference Books:

1. Santanu Chattopadhyay, “Compiler Design”, PHI Learning Pvt. Ltd., 2015

Web links:

1. Full course on Compiler Design: https://nptel.ac.in/courses/106104123
2. Compiler Design: https://nptel.ac.in/courses/106108113

DIGITAL FORENSICS			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICOE321**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**3**
Total Hrs	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

1. Gain insights about the basic principles, methodologies, and tools used in computer forensics to investigate digital crimes
2. Understand the various data acquisition methods, understand storage formats, and utilize appropriate tools to collect and analyze digital evidence effectively
3. Comprehend the legal frameworks, privacy concerns, and ethical issues surrounding computer forensics, ensuring adherence to laws and professional standards during investigations
4. Improve their knowledge about the various contemporary software and hardware tools, validating and testing forensic software, and addressing data-hiding techniques.

Module 1: Introduction to Digital Forensics	**No. of Hrs: 8**

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts, legal concerns and private issues.

Text Book 1: Chapter 1, Chapter 2

Module 2: Computing Investigations	**No. of Hrs: 8**

Understanding Computing Investigations – Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

Text Book 1: Chapter 8, Chapter 9

Module 3: Data acquisition	**No. of Hrs: 9**

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

Text Book 2: Chapter 4

Module 4: Module 4: Processing crimes and incident scenes	**No. of Hrs: 8**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

Text Book 1: Chapter 12

Module 5: Current computer forensics tools	**No. of Hrs: 9**

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Text Book 2: Chapter 5

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

1. Understand the capability to plan and execute corporate investigations involving digital evidence, including securing incident scenes and seizing digital evidence appropriately.
2. Explain various data recovery workstations, selecting suitable acquisition methods, and employing tools to perform RAID and remote network data acquisitions.
3. Understand the storing, and validating digital evidence, including obtaining digital hashes and ensuring the integrity of evidence throughout the investigation process.

4. Explain the specialized investigations, such as email crimes, by understanding email server architectures and utilizing dedicated forensic tools.

Textbooks:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

Web links:

1. Digital Forensics Full Course: https://youtu.be/vD7uJ8aP0zA?si=hiJGUHtyrL8ALiys
2. What is Digital Forensics: https://youtu.be/jrDwZy8I-pg?si=nsux94IsHZNB9rib
3. Digital Forensics: https://youtu.be/JfvHzsexnmc?si=QmXPMlVAtmrzV7TV

INTRODUCTION TO MACHINE LEARNING			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSOE322**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives: This course is designed to

1. Impart the knowledge on core concepts and underlying principles of machine learning.
2. Familiarize the various data preprocessing techniques.
3. Enable to build basic Machine Learning models using classification, regression, gradient descent algorithms and ensemble methods

Module 1: Foundations of Machine Learning	**No. of Hrs: 8**

Learning Problems, Designing a Learning System, Perspectives & Issues in Machine Learning, A Concept Learning Task, Concepts Learning as Search, Find S, Version Spaces and Candidate Elimination Algorithm, Inductive Bias, Introduction to Machine Learning, Framework for Developing Machine Learning Models

Text Book

Module 2: Dataset Pre-processing	**No. of Hrs: 8**

Data Preparation Tasks: Data Cleaning, Feature Selection, Data Transforms Feature Engineering, Dimensionality Reduction, Data Preparation: Problems with Naive Data Preparation, Train and Test dataset, K-Fold Cross Validation, Data Cleaning: Basics of Data Cleaning, Outlier Identification and Removal, Marking and Remove Missing Data, Statistical Imputation, Feature Selection :Overview of Feature Selection, Categorical Feature Selection, Numerical Feature Selection, Data Transforms: Scale numerical data, Encoding Categorical Data, Dimensionality Reduction:-LDA, PCA, SVD

Text Book

Module 3: Linear Regression and Gradient Descent	**No. of Hrs: 9**

Linear Regression: Introduction, Steps in Building Linear Regression, Building the Linear Regression Model, Gradient Descent Algorithm, Scikit-Learn Library for Machine Learning: Splitting Dataset, Building Regression Model, Prediction, Measuring Accuracy- R Squared Value, RMSE, Bias-Variance Trade-off, K-fold Cross Validation, Advanced Regression Model: Building Regression Model for IPL Dataset**,** Applying Regularization

Text Book

Module 4: Classification	**No. of Hrs: 9**

Overview of Classification Problems, Binary Logistic Regression, Credit Classification example, Model Evaluation: Receiver Operating Characteristic (ROC) and Area Under the Curve (AUC), Confusion Matrix, Finding Optimal Classification Cut-off: Youden's index, Cost-based approach, K-Nearest Neighbors, Bayes Theorem: Bayes Theorem & Concept Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Learning to Classify Text, Bayesian Belief Network, EM Algorithm

Text Book

Module 5: Advanced Machine Learning Algorithms	**No. of Hrs: 8**

Ensemble Learning and Random Forests: Voting Classifiers, Bagging and Pasting, Random Patches and Random Subspaces, Random Forests, Boosting, Stacking, Clustering: K-Means Clustering, Support Vector Machines (SVM): Linear SVM Classification, Nonlinear SVM Classification, SVM Regression, Decision Function and Predictions, Training Objective.

Text Book

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

1. Describe the foundational concepts of Concept Learning & Machine learning.
2. Applies the essential data preparation techniques for robust and efficient machinelearning implementations.
3. Apply regression model and gradient descent algorithm to various realistic dataset & evaluate the performance evaluation of models.
4. Apply various Classification algorithm to realistic dataset & evaluate the performance evaluation of models.
5. Apply ensemble approach, SVM & K-Means algorithms to realistic dataset and finetune the model for performance increase

Textbooks:

1. Tom M. Mitchell, "Machine Learning", Mc Graw Hill, 2003
2. Jason Brownlee: Data Preparation for Machine Learning: Data Cleaning, FeatureSelection, and Data Transforms in Python,2020
3. Manaranjan Pradhan, U Dinesh kumar," Machine Learning using Python", Wiley, 2019
4. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, andTensorFlow", 2nd Edition, O'Reilly Publisher, 2019

Reference Books:

1. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python A Guide for Data Scientists", 1st Edition, O'Reilly Publisher, 2016

Web links:

1. NPTEL Course on Machine Learning : http://digimat.in/nptel/courses/video/106105152/L01.html
2. Youtube Course on Machine Learning : https://www.youtube.com/watch?v=LcWFedjaR4Q

INTRODUCTION OF DATA SCIENCE			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSOE323**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives: This course is designed to

1. Familiarize the fundamentals of data science.
2. Explain data collection, preprocessing, and statistical methods.
3. Analyze relationships between data using machine learning and statistical techniques
4. Develop proficiency in Python data wrangling.
5. Design and implement effective data visualizations

Module 1: Introduction to Data Science & Statistical Foundations	**No. of Hrs: 8**

Data Science, Why Now?, Datafication, The Current Landscape, Data Science Jobs and Profile, Academia vs. Industry Roles, Statistical Thinking in Big Data, Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Big Data Assumptions, Modeling, Exploratory Data Analysis, Philosophy of EDA, The Data Science Process, A Data Scientist's Role, Case Study: RealDirect

Text Book1: Chapter 1, Chapter 2

Module 2: Machine Learning Algorithms & Applications	**No. of Hrs: 8**

Machine Learning Algorithms, Linear Regression, k-Nearest Neighbors (k-NN), k-Means Clustering, Hands-on Exercise: Basic Machine Learning Algorithms, Why Linear Regression and k-NN Don't Work for Spam Filtering, Naive Bayes and Bayes' Law, Spam Filtering Using Naive Bayes, Laplace Smoothing, Comparing Naive Bayes to k-NN, Data Wrangling and Web Scraping, APIs and Tools for Data Collection, Naive Bayes for Text Classification

Text Book1: Chapter 3, Chapter 4

Module 3: Logistic Regression, Financial Modeling & Optimization	**No. of Hrs: 8**

Logistic Regression, Interpretability and Scalability, M6D Logistic Regression Case Study, Click Models, Newton's Method and Stochastic Gradient Descent, Model Implementation and Evaluation, Time Stamps and Data Analysis, Financial Modeling Concepts, Preparing and Processing Financial Data, Log Returns and Volatility Measurement, Regression and Bayesian Priors, Financial Modeling Feedback Loop

Text Book1: Chapter 5, Chapter 6

Module 4: Feature Engineering & Recommendation Systems	**No. of Hrs: 8**

Feature Selection Methods, Decision Trees and Random Forests, Filters and Wrappers, Embedded Feature Selection Methods, User Retention Analysis, Google's Hybrid Approach to Social Research, Privacy Considerations, Recommendation Systems, Nearest Neighbor Review and Limitations, Beyond Nearest Neighbor: Machine Learning Approaches, Dimensionality Reduction using PCA and SVD, Alternating Least Squares, Recommender System

Text Book1: Chapter 7, Chapter 8

Module 5: Data Visualization & Fraud Detection	**No. of Hrs: 10**

History and Evolution of Data Visualization, Thought Experiments in Data Science, Data Visualization Projects and Applications, New York Times Data Visualization Case Studies, Goals of Effective Data Visualization, Fraud Detection and Risk Analysis, Model Building and Performance Estimation, Case Study: Data Visualization at Square, Data Science and Risk Management, Data Visualization Exercise

Text Book1: Chapter 9

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

1. Understand and apply core data science concepts in practical scenarios.
2. Describe and summarize data using statistical methods such as inference and modeling.
3. Use regression, classification, and clustering techniques to analyze relationships in data.
4. Implement data wrangling, feature engineering, and machine learning models using R.
5. Develop and apply data visualization techniques for better data-driven decision-making.

Textbooks:

1. Cathy O Neil, Rachel Schutt, 2014, "Doing Data Science-Straight Talk from the Frontline", Orielly
2. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, 2014 Mining of Massive Data Sets, Cambridge University Press

Reference Books:

1. Kevin Murphy, 2013, Machine learning: A Probabalistic Perspective
2. Peter Bruce, Andre Bruce, Practical Statistics for Data Scientists, Orielly Series

Web links:

1. NPTEL course on Data Science: https://archive.nptel.ac.in/courses/106/106/106106179/
2. Course on Power BI: https://www.youtube.com/watch?v=TBVss5711QM&t=2s

YOGA - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC325**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Empower students to achieve and maintain good health.
2. Promote the practice of mental hygiene.
3. Facilitate students in attaining emotional stability
4. Impart moral values and higher level of consciousness

Contents: **No. of Hrs: 13**

- Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi
- Asana by name, technique, precautionary measures and benefits of each asana
- Suryanamaskar13 count- 4 rounds of practice
- Different types of Asanas

a) Sitting
   1. Bakasana
   2. Hanumanasana
   3. Ekapada Rajakapotasana
   4. Yogamudra in Vajrasana

b) Standing
   1. Vatayanasana
   2. Garudasana

c) Balancing
   1. Veerabhadrasana
   2. Sheershasana

d) Supine line
   1. Sarvangasana
   2. Setubandha Sarvangasana
   3. Shavasanaa (Relaxation posture)

- Revision of Kapalabhati practice 40 strokes/min - 3 rounds
- Meaning by name, technique, precautionary measures and benefits of Pranayama Bhramari.

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

1. Describe the meaning, aim and objectives of Yoga.
2. Perform Suryanamaskar and able to analyze its benefits.
3. Exhibit the different Asanas by name, its importance, methods and benefits.
4. Perform Kapalabhati.
5. Perform the different types of Pranayama by its name, precautions, procedure and uses.

Textbooks:

1. Ajitkumar ,"YogaPravesha in Kannada" 1st Edition, Raashtroththaana Saahithya, 2017,ISBN-13: 978-8175310124
2. BKS Iyengar, "Light on Yoga", 1st Edition, Thorsons, 2017, ISBN-13: 978-0008267919
3. Dr. M L Gharote& Dr. S K Ganguly,"Teaching Methods for Yogic practices", 1st Edition, Kaivalyadhama, 2001, ISBN-13 : 978-8189485252

Reference Books:

1. YaminiMuthanna, "Yoga for Children step by step", 1st Edition, Om Books International, 2022, ISBN-13: 978-9394547018

Web links:

1. My Life My Yoga: https://youtu.be/KB-TYlgd1wE
2. Adiyoga: https://youtu.be/aa-TG0Wg1Ls

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Quiz	20
2	Practical demonstration	50
3	Final Report	30
	Total	**100**

PHYSICAL EDUCATION - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC326**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Impart the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Build a strong foundation for the professionals in Physical Education and Sports

Contents:	**No. of Hrs: 13**

- Importance of nutrition for optimal performance and healthy eating habits. (Lectures)
- Mindfulness and stress management techniques like meditation. (Practical Sessions)
- Emphasis on teamwork, communication, and sportsmanship. (Practical Sessions)
- Specific Games (Students continue prior semester's game by practicing Advanced Skills)

Basket Ball	Behind-the-back dribble - Spin moves - Alley-oop passes - Shooting off the dribble - Advanced footwork and shot creation techniques
Cricket	Reverse swing and googly bowling - Spin bowling variations (leg spin, off spin) - Captaincy skills - Advanced batting techniques (switch hitting)
Football	Advanced dribbling techniques (stepovers, fakes) - First touch passing and control - Volley control and shooting - Set pieces (free kicks, corner kicks) Advanced heading techniques - Goalkeeper diving and shot-stopping
Hockey	Deke moves and advanced stickhandling - Aerial control - Passing variations (chip pass, scoop pass) - Penalty corner techniques - Advanced defensive strategies
Kabaddi	Advanced raiding maneuvers (super raid) - Quick and deceptive raiding holds - Strategic raiding based on game situation - Strong team defense coordination - Advanced anti-raid tactics
Karate	Advanced kumite strategies and tactics - Complex combinations of attacks and counters - Throwing and takedown techniques (sweeps, trips) - Advanced conditioning and strength training
Table Tennis	Advanced footwork for quick movement - Smashing technique - Serving variations (sidespin, flick serve) - Deceptive spins and tactics - Advanced match play strategies
Throwball	Jump shot and other variations - No-look passes and behind-the-back passes - Quick throws and fast breaks - Advanced dodging techniques and footwork - Zone defense and press defense strategies
Volleyball	Offensive spiking mechanics (jumping and hitting the ball

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

1. Demonstrate an understanding of the link between nutrition, performance, and healthy eating habits
2. Demonstrate improved self-awareness, stress management skills, and effective teamwork through participation in sportsmanship-focused activities.
3. Perform in the selected sports or athletic events

Textbooks:

1. Muller, J. P., "Health, Exercise and Fitness", 1st Edition, Sports Publication, 2018
2. Uppal, A.K., "Physical Fitness", Friends Publication New Delhi, 1992.
3. Russell R.P., "Health & Fitness through Physical Education: Human Kinematics", Human Kinetics Publishers, 1994

Reference Books:

1. Anaika, "Play Field Manual", Friends Publication New Delhi, 2005
2. IAAF Manual
3. Pinto John & Roshan Kumar Shetty, "Introduction to Physical Education"

Web links:

1. https://www.youtube.com/watch?v=wvlztaJYKYI
2. https://www.youtube.com/watch?v=d393LzvqG3E&list=PL94CA1fTzfEd8FkpCa0WNTF7y1pFWNFKc
3. https://www.youtube.com/watch?v=m7EhWv4wgP4

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Participation of students	20
2	Quizzes-2, each of 15 marks	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**

NATIONAL SERVICE SCHEME - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC327**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. Develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens
2. Develop youth leadership in the students
3. Induce social consciousness among students through various societal activities.
4. Impart knowledge in finding practical solutions to individual and community problems

Contents: **No. of Hrs: 13**

Introduction:

- Basic first aid skills
- Disaster preparedness, emergency evacuation

Activities:

- Environment Awareness and Conservation
- Obstacle management Training, conflict management and negotiation skills

Note:

- Students in individual or in a group should select any one activity in the beginning of each semester till end of that respective semester for successful completion as per the instructions of NSS officer with the consent of HOD of the department
- At the end of every semester, activity report should be submitted for evaluation

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

1. Understand the importance of nation building and individual contribution to the betterment of the society
2. Discover grassroots challenges of community and solve them by technological intervention
3. Create societal impact by upholding the value of one for all and all for one
4. Maintain discipline and team spirit

Textbooks:

1. Ministry of Youth Affairs & Sports, Government of India (2022) "National Service Scheme Manual"
2. Rajiv Gandhi National Institute of Youth Development, Ministry of Youth Affairs & Sports, Government of India, (2017)"Introduction Training Module for National Service Scheme (NSS) Program officers"
3. Gurmeet Hans (1996), "Case material as Training Aid for field workers" TISS

Reference Books:

1. Dr. G R Bannerjee, (2012),Social service opportunities in Hospitals, TISS
2. Ram Ahuja (Third Edition, 2014), Social Problems in India, Rawat publications

Web links:

1. History of NSS :https://thebetterindia.com/140/national-service-scheme-nss/
2. NSS – an introduction https://www.youtube.com/@nationalserviceschemeoffic4034/videos

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Participation of students	30
2	Individual contribution to success of the program	40
3	Report preparation	30
	Total	**100**

Arts - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC328**	SEE Marks	**-**
Teaching Hrs/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hrs	**13**	Credits	**-**

Course Learning Objectives: This course is designed to

1. To impart an understanding of the creative process from initial concept to final execution
2. Create and demonstrate proficiency in a chosen arts discipline through practical application
3. Analyze and appreciate diverse art forms and styles
4. To participate in art competitions at regional, state, national, and international levels, as well as in cultural events

Contents: **No. of Hrs: 13**

Note: Student will continue the arts form selected in previous semester.

Performing Arts (Dance)	Orientation, Cinema Script Writing, Audition Techniques, Shooting Script, Basics Direction and Camera, Group Assignments, Group Presentation, Evaluation.
Arts & Crafts	Orientation, Puppetry: Glow Puppetry- Head Puppets -Animal Puppetry -POP Puppetry- Group Presentation- Evaluation
Theatre	Orientation, Theatre Music, Theatre Choreography, Script Writing, Group Production, Grand Rehearsals, Group Show, Evaluation.

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

1. To be capable of creating choreography and delivering live performances for an audience.
2. Employ a range of acting techniques and use them to create a performance.
3. Evolve into creative, effective, independent, and reflective individuals capable of making informed decisions in both process and performance.
4. Acquire knowledge and comprehension of the roles and processes used in current theatre arts practice.

Textbooks:

1. Music in Theory and Practice by Bruce Benward and Marilyn Sake, McGraw-Hill Education,2014
2. Art Fundamentals: Theory and Practice by Otto G. Ocvirk, Robert E. Stinson, Philip R. Wigg, Robert Bone, and David L. Cayton, McGraw-Hill Education,2012
3. The Viewpoints Book: A Practical Guide to Viewpoints and Composition by Anne Bogart and Tina Landau, Theatre Communications Group,2004

Reference Books:

1. Dance Composition: A practical guide to creative success in dance making, Jacqueline M. Smith
2. The Artist's handbook of method and materials by Ralph Mayer
3. Glimpses of Indian music and dance by Dr. Arun Bangre

Web links:

1. https://ccrtindia.gov.in/audio-visual-catalogue/

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Students Participation	20
2	Quizzes-2 (each of 15 marks)	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**