AUTONOMOUS

SYLLABUS

V & VI Semesters

B.E in Computer Science & Engineering

2023

MITE

Invent Solutions

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING
(A Unit of Rajalaxmi Education Trust®, Mangalore)
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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 establish as a Center of Excellence in Education and Research in the field of Computer Science & Engineering for transforming the students into Competent Professionals"

Department Mission

- *Provide strong theoretical and practical background in Computer Science & Engineering and allied fields of Engineering.*
- *Provide excellent state of the art infrastructure and competent man power to facilitate the need based technical education to the students with ethical and social values.*
- *Encourage students to involve in Co-curricular and extracurricular activities.*
- *Promote Research and Innovation activities among the staff and students.*

Program Educational Objectives (PEOs)

Graduates of Computer Science and Engineering program will

- *Design, develop and maintain reliable software systems to satisfy the needs of customers.*
- *Do research and development to meet the challenges of changing technologies.*
- *Work in teams to fulfill the societal and industrial needs.*

Program Specific Outcomes (PSOs)
The graduates of the Computer Science and Engineering department will be able to

- *Design, develop, test and maintain the software systems that fulfill the needs of the industry and society*
- *Apply the concept of networking, data storage and computation to solve the real world problems*

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LIST OF COURSES

Sl. No.	Course Code	Course Title	Semester
		V/VI Semester	
HUMANITIES & SOCIAL SCIENCE COURSES			
1	**23HMCC301**	Entrepreneurship, Management & Finance	V
PROFESSIONAL CORE COURSES			
2	**23CSPC302**	Database Management Systems	V
3	**23CSPC303**	Computer Networks	V
4	**23CSPC304**	Formal language and automata theory	V
5	**23CSPC305**	Computer Networks laboratory	V
6	**23CSPC306**	Machine Learning	VI
7	**23CSPC307**	Systems Engineering	VI
8	**23CSPC308**	Compiler Design	VI
9	**23CSPC310**	Compiler Design laboratory	VI
SKILL ENHANCEMENT COURSE			
10	**23CSSE309**	Project Phase-1	VI
PROFESSIONAL ELECTIVE COURSES			
11	**23CSPE311**	Full stack development	V
12	**23CSPE312**	Internet of Things	V
13	**23CSPE313**	Digital Image processing	V
14	**23CSPE321**	Cryptography and Network security	VI
15	**23CSPE322**	Cloud Computing	VI
16	**23CSPE323**	Parallel Programming	VI
OPEN ELECTIVE COURSES			
17	**23CSOE311**	Ethical Hacking	V
18	**23CSOE312**	Introduction to Database Management System	V
19	**23CSOE313**	Java Programming	V
20	**23CSOE321**	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): Computer 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 Department	3	0	0	50	50	100	3	3
2	23CSPC302	Database Management Systems	Professional Core Course	CSE Allied Branches	3	0	2	50	50	100	3	4
3	23CSPC303	Computer Networks	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
4	23CSPC304	Formal language and automata theory	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
5	23CSPC305	Computer Networks laboratory	Professional Core Course	CSE Allied Branches	0	1	3	50	50	100	2.5	2
6	23CSPE31X	Professional Elective -I*	Professional Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
7	23CSOE31X	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***	Non Credit Compulsory 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 score card 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	23CSPE311	Full stack development
2	23CSPE312	Internet of Things
3	23CSPE313	Digital Image processing

**Open Elective -I Course(s):

Sl. No.	Course Code	Course Title
1	23CSOE311	Ethical Hacking
2	23CSOE312	Introduction to Data Base Management System
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

Note:*** To be offered from 3rd to 6th Semester

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VI Semester (2023 Scheme): Computer 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	23CSPC306	Machine Learning	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
2	23CSPC307	Systems Engineering	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	2.5	2
3	23CSPC308	Compiler Design	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	2.5	2
4	23CSPC310	Compiler Design Laboratory	Professional Core Course	CSE Allied Branches	0	1	3	50	50	100	2.5	2
5	23CSSE309	Project Phase-I	Project	CSE Allied Branches	-	-	6	100	-	100	-	3
6	23CSPE32X	Professional Elective-II*	Professional Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
7	23CSOE32X	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***	Non Credit Compulsory 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	23CSPE321	Cryptography and Network security
2	23CSPE322	Cloud Computing
3	23CSPE323	Parallel Programming

**Open Elective -II Course(s):

Sl. No.	Course Code	Course Title
1	23CSOE321	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: This course is designed to
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.
Text book 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

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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.

Text Books:
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

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Database Management System			
Semester	V	CIE Marks	**50**
Course Code	**23CSPC302**	SEE Marks	**50**
Teaching Hrs/Week (L:T: P)	**3:0:2**	Exam Hrs	**03**
Total Hrs	**64(40+24)**	Credits	**04**

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: 8

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, Multi-valued 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

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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 Copies Available 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 leastone 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.**

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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.

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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.

Text Book:
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-GrawHill, 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

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Computer Networks			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPC303**	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 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 3, 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: Standard Ethernet.

Text Book 1: Chapter 10, Chapter 11,Chapter 12, Chapter 13.2

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 19.1, Chapter 20, Chapter 21.3.2

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, Socket interface programming. Standard Client-Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System(DNS), Secure Shell (SSH),

Text Book 1: Chapter 25.1,25.2 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

Text Book:
1. Behrouz A. Forouzan, Data Communications and Networking with TCP-IP 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

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Formal Languages and Automata Theory			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSPE311**	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.

Text Books:
1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata 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,TataMcGraw-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/

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Computer Networks Laboratory			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSPC305**	SEE Marks	**50**
Teaching Hrs/Week (L:T: P)	**0:1:3**	Exam Hrs	**2.5**
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. **VLANConfiguration 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.

Text Book:

1. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP 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

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Full Stack Development			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSPE311**	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**

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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.

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

Reference Book:
1. Juha Hinkula,"Full Stack Development with Spring Boot 3 and React: Build modern web applications using the power of Java, React, and TypeScript", packt, 2023

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/

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Internet of Things			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSPE312**	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. Impart the students with a solid understanding of the IoT Framework
2. Familiarize students with IoT architecture drivers, core functional stack, data handling, connectivity technologies, and communication protocols.
3. Impart students with an understanding of IoT design frameworks and operational specification with Immersive learning experiences onExemplary Devices.
4. Illustrate IoT case studies in smart solutions and IoT methodologies across various fields.

Module 1 Introduction to Internet of Things	No. of Hrs: 8

Introduction to Internet of Things (IoT),Evolution of IoT, IoT versus Machine to Machine(M2M), IoT versus Cyber Physical System(CPS), IoT versus Web of Things (WoT), IoT Networking Components, Addressing Strategies in IoT
IoT characteristics, Physical design of IoT, Logical design of IoT and IoT Enabling Technologies

Text book1: 4.1,4.2,4.4,4.5.
Text Book 2: 1.1,1.2,1.3,1.4

Module 2 IoT Architectural Overview	No. of Hrs: 8

IoT architecture, Drivers behind new network Architecture, comparing IoT architectures, A simplified IoT architecture, The Core IoT functional Stack, IoT Data Management and Compute Stack.

Text Book 3: Chapter 2

Module 3 IoT Protocols and Point-to-Point Communication	No. of Hrs: 10

IoT Connectivity Technologies: IEEE 802.15.4 Wireless Personal Area Network, Zigbee, RFID, NFC, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth
IOT communication protocols: Data Protocols- Message queue telemetry transport (MQTT), Publish-subscribe modes, MQTT-SN, Constrained Application Protocol (CoAP), Advanced Message Queuing Protocol (AMQP), Extensible Messaging and Presence Protocol, (XMPP)

Text book 1: 7.2, 7.3,7.7,7.8,7.1.2,7.13,7.14,7.15,7.16
Text book 1: 8.4.1, 8.4.2, 8.4.3, 8.4.4,8.4.5

Module 4 IOT System Design & Physical Devices	No. of Hrs: 8

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loT Design Methodology: introduction to IoT Design Methodology, Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration. Application Development **loT Physical Devices**: Basic building blocks of an loT Device, Exemplary Device: Raspberry Pi About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces **Text Book 2:**5.1, 5.2,7.1,7.2,7.3,7.4,7.5	
Module 5: Case Studies Illustrating loT Design	**No. of Hrs: 8**
Home Automation: Smart Lighting, Home Intrusion Detection, **Cities:** Smart Parking, **Environment:** Weather Monitoring System, Weather-Reporting Bot, Air Pollution Monitoring**,** Forest Fire Detection**: Agriculture**: Smart Irrigation **Productivity Applications**: IoT printers **Text Book 2**: 9.2,9.3,9.4,9.5,9.6	

Course Outcomes: At the end of the course, the student will be able to
1. Understand the essential IoT fundamentals and technologies.
2. Apply IoT architecture, manage data efficiently, utilize communication technologies and protocols, in IoT-based applications
3. Analyze IoT design frame works, and operational specifications and utilize them in exemplary IoT devices.

Text Books:
1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press, 2021.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoTFundamentals: Networking Technologies, Protocols, and Use Cases for the Internet ofThings", 1st Edition, Pearson Education (Cisco Press Indian Reprint),2018

Reference Books:
1. Dennis, Andrew K,"Raspberry Pi home automation with Arduino",Packt Publishing Ltd, 2013
2. Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017

Web links:
1. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs31/
2. Internet of Things (IoT), Mobile Devices and its Safety | Central Institute of Educational Technology | A Constituent unit of NCERT
3. Internet of Things - IoT - YouTube

Digital Image Processing			
Semester	V	CIE Marks	50
Course Code	23CSPE313	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 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.ofHrs: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.ofHrs:9

Image Enhancement: Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Image enhancement process in frequency domain, Low pass and High pass Filters.
Morphological Image Processing: Morphology, 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.ofHrs:9

Image Segmentation: Fundments, 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.

Text Book-1:Chapter– 10.1,10.2,10.3,10.4,10.5,10.6

Module 4: Feature Extraction	No.ofHrs:9

Feature Extraction: Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features.

Text Book 1:Chapter–11.1,11.2,11.3,11.4,11.5,11.6

Module 5: Image Pattern Classification	No.ofHrs:8

Pattern Analysis: Patterns and Pattern Classes, Pattern Classification by Prototype Matching, Optimum (Bayes) Statistical Classifiers, Neural Networks and Deep Learning.

Text Book 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.

Text Book:
1. RefaelC.Gonzalezand, RichardE.Woods, "DigitalImageProcessing",4thedition .

Reference Books:
1. D.Forsyth ,J.Ponce, "ComputerVision- A Modern Approach"
2. B. K. P. Horn,"Robot Vision", MIT Press
3. D.H.Ballard,C.M.Brown , "ComputerVision", Prentice-Hall, 1982.

Web links:
1. Full course**:** https://onlinecourses.nptel.ac.in/noc19_cs58/preview
2. Full course: https://onlinecourses.nptel.ac.in/noc19_ee55/preview

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Ethical Hacking			
Semester	V	CIE Marks	**50**
Course Code	**23CSOE311**	SEE Marks	**50**
Teaching Hrs/Week (L: T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

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-

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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.

Text Books:
1. The Experts: EC-Council, "Ethical Hacking and Countermeasures Attack Phases", Cengage Learning,2016.

Reference Books:
1. James S. Tiller, "The Ethical Hack: A Framework for Business Value Penetration Testing", Auerbach Publications, CRC Press.2004.
2. Michael Simpson, Kent Backman, James Corley, "Hands-On Ethical Hacking and Network Defense", Cengage Learning,2010.
3. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams, "Gray Hat Hacking - The Ethical Hackers Handbook", 3rd Edition, Tata McGraw-Hill,2011.

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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/

Introduction To Database Management System			
Semester	**V**	CIE Marks	**50**
Course Code	**23CSOE312**	SEE Marks	**50**
Teaching Hours/Week(L:T:P)	**3:0:0**	Exam Hrs	**03**
Total Hours	**42**	Credits	**03**

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 data base design.
4. Familiarize SQL queries for various data retrieval scenarios.

Module1: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.
TextBook1 Chapter1.1to1.9,Chapter2.1to2.5

Module2DataModels	**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.
TextBook1 Chapter3.3to3.7,Chapter5.1to5.3,Chapter8.1to8.5,Chapter9.1

Module3Normalization	**No. of Hrs:8**

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.
TextBook1 Chapter14.1to14.7,Chapter15.1

Module4QueryProcessing	**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.
TextBook1 Chapter6.1to6.4,Chapter7.1to7.4

Module5TransactionManagement	**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.
TextBook1 Chapter20.1,20.2.1,20.3,20.5.1,20.5.2,20.6,Chapter21.1.1,Chapter 22.1.3,22.4,22.5

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

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

Text Book:

1. Navathe , "FundamentalsofDatabaseSystems",RamezElmasriandShamkantB.,7th Edition, Pearson, 2017.

Reference Books:

1. Ramakrishnan, and Gehrke , "Databasemanagementsystems",3rdEdition,McGraw Hill, 2014.
2. Silberschatz Korth and Sudharshan, "DatabaseSystemConcepts",7thEdition,Mc-GrawHill, 2019.
3. Coronel, Morris, and Rob, "Database Principles: Fundamentals of Design, Implementation Management ",10th Edition,CengageLearning,2014.

Web links:

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

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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
Text Book1: 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, ReturningObjects, Recursion, Access Control, understanding static and final keywords, Nested and Inner Classes
Text Book 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
Text Book 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
Text Book 1: Chapter 9 and 10

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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 Auto boxing / Unboxing Occurs in Expressions, Autoboxing/ Unboxing of Boolean, Character Values etc. Text Book 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	

Text Book: 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	

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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) UrdhvaHastothanasana 　2) Hastapadasana 　3) ParivrittaTrikonasana 　4) Utkatasana	
c) Prone line 　1) PadangushthaDhanurasana 　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	

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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

Text Book:
1. Ajitkumar," Yoga Pravesha in Kannada" 1st Edition, Raashtroththaana Saahithya, 2017.
2. BKS Iyengar, "Light on Yoga", 1st Edition, Thorsons, 2017
3. Dr. M L Gharote& Dr. S K Ganguly, "Teaching Methods for Yogic practices", 1st Edition, Kaivalyadhama, 2001.

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	Practicaldemonstration	50
3	FinalReport	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 an through balls-Tackling techniques (sliding & standing)-Shooting with power and accuracy-Playing different positions
Hockey	Stickh and lingintight spaces-Slap shot 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(repetitionofbasictechniques)-Kata(formstopracticetechniqueandflow)-Combinations of punches and kicks-Foot work and movement-Basic kumite (sparring) techniques.
Table serves-Tennis	Looping technique (fore hand and back hand) –Top spin and backspin Footworkforattackinganddefense-Blockingandcounteringtechniques-Matchstrategyandtactics.

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Throwball	Longthrowsandbouncepasses-Fakepassesanddeceptionmoves-Dodgingtechniquestocreatespace-Defensivepositioningandguardingtechniques-Teamoffenseandsetplays
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. Developstrategiestopromoteethicalconductandapositivesportingculture
2. Understand the importance of ethics and moral values in sports and games
3. Perform in the selected sports or athletic events.

Text Books:
1. Muller,J.P.,"Health,ExerciseandFitness",1st Edition,SportsPublication,2018
2. Uppal, A.K.," Physical Fitness", Friends PublicationNewDelhi,1992
3. RussellR.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_8myp4njEDcoYyZkBq-542S5

Scheme & Assessment:

Sl.No.	Activity	Marks
1	Participation of students	20
2	Quizzes-2,eachof15marks	30
3	Finalpresentation/Exhibition/ParticipationinCompetitions(CertificateofparticipationinNational/International)	50
	Total	**100**

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National Service Scheme -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, brother hood, the spirit of adventure and ideals of self less 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 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

Text Books:
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

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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**

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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. Impartanunderstandingofthecreativeprocessfrominitialconcepttofinalexecution.
2. Createanddemonstrateproficiencyinachosenartsdisciplinethroughpracticalapplication
3. Analyze and appreciate diverse art forms and styles
4. Toparticipateinartcompetitionsatregional,state,national,andinternationallevels,aswellas inculturalevents

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 demand 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, Practicaluse 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. Capableofcreatingchoreographyanddeliveringliveperformancesforanaudience.
2. Employ arrange 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. **MusicinTheoryandPractice**byBruceBenwardandMarilynSake,McGraw-HillEducation,2014
2. **ArtFundamentals:TheoryandPractice**byOttoG.Ocvirk,RobertE.Stinson,PhilipR.Wigg,RobertBone,andDavidL.Cayton,McGraw-HillEducation,2012
3. **TheViewpointsBook:APracticalGuidetoViewpointsandComposition**byAnneBogartandTinaLandau,TheatreCommunicationsGroup,2004

Reference Books:
1. **DanceComposition:Apracticalguidetocreativesuccessindancemaking**,Jacqueline M.Smith
2. **The Artist, 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(eachof15marks)	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**

Machine Learning			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPC306**	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 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 to Machine Learning & 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 is Data types, Bigdata Analytics and Types of Analytics, Bigdata Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization

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.

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

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

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,

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.

Text Book:

1. S Sridhar, M Vijayalakshmi, "Machine Learning", 1st , OXFORD University Press 2021.

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

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Systems Engineering			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPC307**	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 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

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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.

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.

Compiler Design			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPC308**	SEE Marks	**50**
Teaching Hours/Week(L:T:P)	**2:0:0**	Exam Hrs	**2.5**
Total Hours	**26**	Credits	**2**

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

Module1 Introduction to compilation and lexical analysis	**No. of Hrs: 5**

Language Processors, Structure of a compiler, Lexical analyzer: Tokens, Patterns and lexemes, Attributes of tokens. Input buffering, Specification of tokens, Recognition of tokens.
Chapter1.1,1.2,3.1,3.2,3.3,3.4

Module2 Syntax Analysis	**No. of Hrs: 6**

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. Chapter4.1,4.2,4.3,4.4, 4.5,4.6,4.7

Module3 Semantic Analysis	**No. of Hrs: 5**

Syntax Directed Definition (SDD),Evaluation order for SDDs, Application of syntax directed translation (SDT), SDT schemes, Implementing L-attributed SDDs
Chapter5.1,5.2,5.3,5.4,5.5

Module4 Intermediate Code Generation	**No. of Hrs: 5**

Variants of syntax trees, Three address code, Translation of expressions, Control flow, Backpatching, Switch statements
Chapter 6.1, 6.2, 6.4, 6.6, 6.7, 6.8.

Module5 Code optimization and Code generation	**No. of Hrs: 5**

Issues in code generator, Target language, Basic blocks and flow graphs, optimization of basic blocks, A simple code generator, peephole optimization.
Chapter8.1, 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

Text Book: 1. Aho, Sethi, and Ullman, "Compilers: Principles, Techniques, and Tools", 2nd Edition, Addison-Wesley, 2001
Reference Book: 1. Santanu Chattopadhay, "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

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Compiler Design Laboratory			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPC310**	SEE Marks	**50**
Teaching Hrs/Week(L:T:P)	**0:1:3**	Exam Hrs	**2.5**
Total Hrs	**36**	Credits	**2**

Course Learning Objectives: This course is designed to
1. Provide knowledge on language translators
2. Impart knowledge on tokenization of input text stream
3. Familiarize language specification using Context Free Grammars and Parsers

Lab Experiments	No. of Hrs:36

1. Write lex specification for given pattern
2. Write YACC specification for the given language
3. Implementation of Lexical analyzer using LLVM
4. Implementing parsers using LLVM
5. Generating code with LLVM backend
6. Write a recursive decent parser for the CFG language and implement it using LLVM
7. Write LR parser for the CFG language and implement it using LLVM

Course Outcomes: At the end of the course, the student will be able to
1. Implement lexical analyzers for the given specification
2. Develop parsers for the context free grammars
3. Develop code generators

Text Books:
1. Kai Nacke," Learn LLVM12:Abeginner's guide to learning LLVM compiler tools and core libraries with c++",Packt,2021.
2. JohnR. Levine,Tony Mason, Doug Brown,"lex&yacc",O'Reilly,2ndEdition,1992

Reference Book:
  1.Watson,Des,"ApracticalApproachtoCompilerconstruction",SpringerInternational publishing ,2017

Web links:
 1. Programming with LLVM**:** https://www.youtube.com/watch?v=Lvc8qx8ukOI
 2. LLVM tutorials:
    https://www.youtube.com/playlist?list=PLeLcvrwLe186zagYCezI47uKs7YAqyO6d

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Project Phase – I			
Semester	**VI**	CIE Marks	**100**
Course Code	**23CSSE309**	Credits	**03**
Hours/Week (L: T:P)	**0:0:6**	Mode	**Experiential**

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 the 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.

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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.

Cryptography & Network Security			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPE321**	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. 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. Apply classical encryption techniques and block cipher principles to secure data in networked systems.
2. Apply public key cryptographic algorithms and key exchange protocols to secure communication and mitigate attacks.
3. Apply cryptographic hash functions and key management techniques to establish secure key distribution and trust models.
4. Articulate user authentication and e-mail security mechanisms to protect users and communication in networked environments.
5. Describe IP security architecture and protocols used to provide secure communication at the network layer.

Text Book:

1. William Stallings, "Cryptography and Network Security", Pearson Publication, 7th Edition, 2017

Reference Books:

1. Keith M Martin, "Everyday Cryptography", Oxford University Press,2013
2. V.K Pachghare,"Cryptography and Network Security", PHI, 2nd Edition, 2015.

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

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Cloud Computing			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPE322**	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 of cloud computing revolution and the business drivers
2. Provide comprehensive understanding of virtualization and various models of cloud computing
3. Comprehend the importance of cloud security and defense strategies
4. Explain the industrial cloud platform and native applications

Module1:IntroductiontoCloudComputing	No. of Hrs: 09

Cloud Computing at a Glance, Historical Developments, Cloud Computing Environments, Cloud computing platforms and technologies: Amazon Web Services (AWS), Google AppEngine, Microsoft Azure.
Principles of Parallel and Distributed Computing: Parallel Vs Distributed Computing, Elements of Parallel computing, Elements of Distributed Computing
Textbook1:Chapter1:1.1to1.4,Chapter2:2.2to2.4

Module2:Virtualization	No.of Hrs: 08

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, VMware, Microsoft Hyper-V
Textbook1:Chapter3:3.1to3.6

Module3:CloudComputingArchitecture	No.of Hrs: 09

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.
Public cloud platforms: GAE, AWS and Azure, Inter-cloud resource management, Extended cloud computing services, Resource provisioning and platform deployment, virtual machine creation and management.
Textbook1:Chapter4:4.1to4.5Textbook2:4.4,4.5

Module4:CloudSecurity	No.of Hrs: 08

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 VM images and management OS, Cloud security defense strategies
Textbook3:Chapter9:9.1to9.6,9.8,9.10
TextBook2:Chapter4:4.6.1

Module5:CloudPlatforminIndustry	No.of Hrs: 08

Amazon web services: - Compute services, Storage services, Communication services, Additional services. Google App Engine: - Architecture and coreconcepts, Application lifecycle, Cost model, Observations, Microsoft Azure

Scientific applications case study: - HealthCare: ECG analysis in the cloud, Biology: gene expression data analysis for cancerdiagnosis, Geoscience: satellite image processing. Business and consumer applications: CRM and ERP, Social networking, media applications

Textbook1:Chapter9:9.1to9.3

Textbook1:Chapter10:10.1to10.2

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

1. Explain various cloud computing plat forms and service provider.
2. Illustrate various virtualization concepts and classify virtualization techniques.
3. Classify 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

Text Books:

1. Rajkumar Buyya, Christian Vecchiola, and ThamraiSelvi, "Mastering Cloud Computing ", McGraw Hill Education, 2013
2. Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, "Distributedand Cloud Computing", Morgan Kaufmann, Elsevier 2012
3. Dan C. Marinescu, "Cloud Computing Theory and Practice", Morgan Kaufmann, Elsevier, 2013

Reference Books:

1. Toby Velte, Anthony Velte,"CloudComputing:A Practical Approach" ,McGraw-Hill Osborne Media,2010.
2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'Reilly Publication,2009.

Web links:

1.FullcourseonCloudComputing:https://nptel.ac.in/courses/106105167

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Parallel Programming			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSPE323**	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 classifications and architectures of parallel computers and their hardware-software characteristics.
2. Familiarize the performance of parallel systems using Amdahl's law, speedup, and scalability metrics.
3. Provide knowledge on parallel programs using MPI and OpenMP for distributed and shared memory.
4. Impart knowledge on GPU-based solutions using CUDA for high-performance computing tasks.

Module 1: Introduction to parallel programming and Parallel hardware	No. of Hrs:8

Introduction, Parallel hardware and parallel software – Classifications of parallel computers, SIMD systems, MIMD systems, Interconnection networks, Cache coherence, Shared-memory vs. distributed-memory.
Chapter 1.1, 1.2, 1.3, 2.3.

Module 2: Parallel software	No. of Hrs:9

Coordinating the processes/threads, Shared-memory, Distributed-memory.
GPU programming, Programming hybrid systems, MIMD systems, GPUs, Performance – Speedup and efficiency in MIMD systems, Amdahl's law, Scalability in MIMD systems, Taking timings of MIMD programs, GPU performance
Chapter 2.4,2.5,2.6

Module 3: Distributed memory programming with MPI	No. of Hrs:8

Distributed memory programming with MPI – MPI functions, The trapezoidal rule in MPI, Dealing with I/O, Collective communication, MPI-derived datatypes, Performance evaluation of MPI programs, A parallel sorting algorithm.
Chapter 3

Module 4: Shared-memory programming with OpenMP	No. of Hrs:9

Shared-memory programming with OpenMP – OpenMP pragmas and directives, The trapezoidal rule, Scope of variables, The reduction clause, loop carried dependency, scheduling, producers and consumers, Caches, cache coherence and false sharing in OpenMP, tasking, tasking, thread safety.
Chapter 5

Module 5: GPU programming with CUDA	No. of Hrs:8

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GPU programming with CUDA - GPUs and GPGPU, GPU architectures, Heterogeneous computing, Threads, blocks, and grids Nvidia compute capabilities and device architectures, Vector addition, returning results from CUDA kernels, CUDA trapezoidal rule I, CUDA trapezoidal rule II: improving performance, CUDA trapezoidal rule III: blocks with more than one warp.
Chapter6.1to6.13

Course Out comes: At the end of the course, the student will be able to
1. Explain the fundamentals of parallel programming models and parallel computer architectures.
2. Apply shared and distributed memory programming models to solve parallel computing problems using OpenMP and MPI.
3. Use performance metrics like speedup, efficiency, and Amdahl's law to analyze parallel applications.
4. Apply GPU-based programs using CUDA to solve computationally intensive problems efficiently.

Text Books:
1. Peter S Pacheco, Matthew Malensek," An Introduction to Parallel Programming", 2nd edition, Morgan Kauffman,2022
2. Michael J Quinn,"Parallel Programming in C with MPI and OpenMp", McGraw Hill.

Reference Books:
1. Calvin L in, Lawrence Snyder, "Principles of Parallel Programming", Pearson, 2008.
2. Barbara, Chapman, "Using OpenMP: Portable Shared Memory Parallel Programming", Scientific and Engineering Computation
3. William Gropp, EwingLusk, "Using MPI: Portable Paralle l Programing", 3rd edition, Scientific and Engineering Computation,2014.

Web links:
1. Introductiontoparallelprogramming:https://nptel.ac.in/courses/106102163

Digital Forensics			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSOE321**	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. 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.

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

Text Books:

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.

Reference Books:

1. Vacca, J, "Computer Forensics, Computer Crime Scene Investigation", 2nd Ed, Charles River Media, 2005.

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. Imparttheknowledgeoncoreconceptsandunderlyingprinciplesofmachinelearning.
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 1

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 Naïve 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

OverviewofClassificationProblems,BinaryLogisticRegression,CreditClassificationexample, 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. Appliestheessentialdatapreparationtechniquesforrobustandefficientmachinelearningimplementations.
3. Applyregressionmodelandgradientdescentalgorithmtovariousrealisticdataset&evaluatetheperformanceevaluationofmodels.
4. ApplyvariousClassificationalgorithmtorealisticdataset&evaluatetheperformanceevaluationofmodels.
5. Applyensembleapproach,SVM&K-Meansalgorithmstorealisticdatasetandfinetune the model for performance increase

Text Books:

1. TomM.Mitchell,"MachineLearning",McGrawHill,2003
2. JasonBrownlee:DataPreparationforMachineLearning:DataCleaning,FeatureSelection,andDataTransformsinPython,2020
3. Manaranjan Pradhan, U Dinesh kumar, "Machine LearningusingPython",Wiley,2019
4. AurelienGeron,"Hands-OnMachineLearningwithScikit-Learn,Keras,andTensorFlow",2ndEdition,O'ReillyPublisher,2019

Reference Books:

1. AndreasC.Müller,SarahGuido,"IntroductiontoMachineLearningwithPythonAGuideforData Scientists",1st Edition,O'ReillyPublisher,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

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Introduction to Data Science			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSOE323**	SEE Mars	**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
Textbook1: Chapter1, 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
Textbook1: Chapter3, Chapter4

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
Textbook1: Chapter5, Chapter6

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
Textbook1: 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

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Risk Management, Data Visualization Exercise
Textbook1: 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.

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

Reference Books:
1. Kevin Murphy, Machine learning: A Probabalistic Perspective,2013.
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

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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. EkapadaRajakapotasana
       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**

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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
Throw ball	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

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Text Books:

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

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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**

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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.

Text Books:

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**