AUTONOMOUS

SYLLABUS

V & VI Semesters

B.E in Computer Science & Engineering (IoT & Cyber Security with Blockchain Technology)

2023

MITE

Invent Solutions

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

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

Institute Vision

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

Institute Mission

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

Department Vision

"Envision becoming a premier department in providing high-quality technical education in IoT, Cyber security, and Blockchain technologies to students, enabling them with industry-relevant skills, critical thinking, and a hands-on approach to tackle real-world challenges in socially responsible and sustainable ways and engage in quality research"

Department Mission

- *To deliver a comprehensive and quality education that equips students with the skills and knowledge needed to excel in IoT, Cyber Security, and Blockchain.*
- *To provide a conducive and pleasant learning ecosystem that promotes research and Innovation activities among the staff and students.*
- *To collaborate with industry, government, and the community to address real-world challenges and contribute to the betterment of society.*
- *Inculcate teamwork, strong ethical values, and lifelong learning skills among students with a sense of societal responsibilities*

Program Educational Objectives (PEOs)

Graduates of the CSE (IoT & Cyber Security with Blockchain Technology) program will be able to

- *Apply their knowledge and skills to succeed in their careers, continue life-long learning, pursue higher education at a reputed institution, and develop their professional knowledge.*
- *Provide innovative solutions, communicate effectively using modern tools, and work productively & ethically in multidisciplinary teams by embracing global challenges with leadership skills.*
- *Design and integrate hardware and software systems through cutting-edge technologies and open-source platforms in IoT, Cyber Security, and Blockchain technologies to provide reliable techno-commercially feasible software solutions for societal and industrial problems.*
- *Achieve excellence in the IT profession by becoming leaders, researchers, entrepreneurs, and catalysts for social change through a high-quality education grounded in mathematics, engineering, and fundamental science principles.*

Program Specific Outcomes (PSOs)

The graduates of the CSE (IoT & Cyber Security with Blockchain Technology) program will be able to

- *Identify Cyber Security vulnerabilities and threats and develop strategies to mitigate these risks, with a focus on Blockchain technologies.*
- *Develop, integrate and optimize IoT solutions across diverse domains, enhancing the efficiency and reliability of interconnected devices and systems.*

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LIST OF COURSES

V/VI Semester Courses			
Sl. No.	**Course Code**	**Course Title**	**Semester**
HUMANITIES & SOCIALSCIENCE COURSES			
1	**23HMCC301**	Entrepreneurship, Management & Finance	V
PROFESSIONAL CORE COURSES			
2	**23ICPC302**	Database Management Systems	V
3	**23ICPC303**	Computer Networks	V
4	**23ICPC304**	Internet of Things	V
5	**23ICPC305**	IoT Lab	V
6	**23ICPC306**	Blockchain Technology	VI
7	**23ICPC307**	Systems Engineering	VI
8	**23ICPC308**	Ethical Hacking	VI
9	**23ICPC310**	Cyber Security Lab	VI
SKILL ENHANCEMENT COURSE			
10	**23ICSE309**	Project Phase-I	VI
PROFESSIONAL ELECTIVE COURSES			
11	**23ICPE311**	Full Stack Development	V
12	**23ICPE312**	Machine Learning	V
13	**23ICPE313**	Formal Language & Automata Theory	V
14	**23ICPE321**	Cryptography and Network Security	VI
15	**23ICPE322**	Cloud Computing	VI
16	**23ICPE323**	Wireless and Mobile Device Security	VI
OPEN ELECTIVE COURSES			
17	**23ICOE311**	Ethical Hacking	V
18	**23ICOE312**	Introduction to Data Base Management Systems	V
19	**23ICOE313**	Java Programming	V
20	**23ICOE321**	Digital Forensics	VI
21	**23ICOE322**	Introduction to Machine Learning	VI
22	**23ICOE323**	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): Department of CSE (IoT & Cyber Security including Blockchain Technology)

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 Sciences	MBA/Any Department	3	0	0	50	50	100	3	3
2	23ICPC302	Database Management Systems	Professional Core Course	CSE Allied Branches	3	0	2	50	50	100	3	4
3	23ICPC303	Computer Networks	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
4	23ICPC304	Internet of Things	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
5	23ICPC305	IoT Lab	Professional Core Course	CSE Allied Branches	0	1	3	50	50	100	2.5	2
6	23ICPE31X	Professional Elective –I*	Professional Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
7	23ICOE31X	Open Elective –I**	Open Elective Course	CSE Allied Branches.	3	0	0	50	50	100	3	3
8	23NMCC32X	Yoga/Physical Education/NSS/Arts***	Non Credit Mandatory Course	Yoga Teacher/ PED/NSS Coordinator/ Cultural Coordinator	0	0	1	100	-	100	-	-
											Total	**21**

Note: MOOC Requirement:

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

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

***Professional Elective Course –I**

Sl. No.	Course Code	Course Title
1	23ICPE311	Full Stack Development
2	23ICPE312	Machine Learning
3	23ICPE313	Formal Language & Automata Theory

****Open Elective Course-I**

Sl. No.	Course Code	Course Title
1	23ICOE311	Ethical Hacking
2	23ICOE312	Introduction to Data Base Management Systems
3	23ICOE313	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

VI Semester (2023 Scheme): Department of CSE (IoT & Cyber Security including Blockchain Technology)

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	23ICPC306	Blockchain Technology	Professional Core Course	CSE Allied Branches	3	0	0	50	50	100	3	3
2	23ICPC307	Systems Engineering	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	2.5	2
3	23ICPC308	Ethical Hacking	Professional Core Course	CSE Allied Branches	2	0	0	50	50	100	2.5	2
4	23ICSE309	Project Phase-I	Project	CSE Allied Branches	-	-	6	100	-	100	-	3
5	23ICPC310	Cyber Security Lab	Professional Core Course	CSE Allied Branches	0	1	3	50	50	100	2.5	2
6	23ICPE32X	Professional Elective-II*	Professional Elective Course	CSE Allied Branches.	3	0	0	50	50	100	3	3
7	23ICOE32X	Open Elective –II**	Open Elective Course	CSE Allied Branches	3	0	0	50	50	100	3	3
8	23NMCC32X	Yoga/Physical Education/NSS/Arts***	Non Credit Mandatory Course	Yoga Teacher/ PED/NSS Coordinator/ Cultural Coordinator	0	0	1	100	-	100	-	-
											Total	**18**

***Professional Elective Course -II**

Sl. No.	Course Code	Course Title
1	23ICPE321	Cryptography and Network Security
2	23ICPE322	Cloud Computing
3	23ICPE323	Wireless and Mobile Device Security

****Open Elective Course-II**

Sl. No.	Course Code	Course Title
1	23ICOE321	Digital Forensics
2	23ICOE322	Introduction to Machine Learning
3	23ICOE323	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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V Semester

VI Semester

Entrepreneurship, Management & Finance			
Semester	**V**	CIE Marks	**50**
Course Code	**23HMCC301**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

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.

Textbook 1: Chapter 2, 3, and 10

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

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

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

Textbook 2: Chapter 5 and 6

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

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

Textbook 3: Chapter 1

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

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

Textbook 3: Chapter 3, 4, 5 and 6

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

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

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

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

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

TEXTBOOKS:

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

REFERENCE BOOKS:

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

Web links:

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

Database Management Systems			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPC302**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:2**	Exam Hrs	**3**
Total Hours	**64**	Credits	**4**

Course Learning Objectives: This course is designed to

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

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

Introduction, Characteristics of database approach, Database Users, Advantages, Evolution of database applications, Disadvantages, Data Models, Schemas, Instances, Three schema architecture, data independence, Database languages, Interfaces, The Database System environment, Centralized and Client/Server architecture of DBMS.

Text Book 1Chapter 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 1Chapter 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, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inference Rules.

Text Book 1Chapter 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 1Chapter 6.1 to 6.4, Chapter 7.1 to 7.4

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

Introduction to Transaction Processing, Transaction and System concepts, ACID properties, Characterizing schedules based on Serializability, Transaction support in SQL. Two-Phase Locking Techniques, Recovery Concepts, Shadow Paging, ARIES Recovery Algorithm.

Text Book 1Chapter 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

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

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

Textbooks:

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

Reference Books:

1. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, McGraw Hill, 2014.
2. Silberschatz Korth and Sudharshan, Database System Concepts, 7th Edition, Mc-GrawHill, 2019.
3. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation Management, 10th Edition, Cengage Learning, 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. Transaction and Concurrency Control: https://www.youtube.com/watch?v=t5hsV9lC1rU

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 Borrowed Books 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. The database contains 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 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 by inserting appropriate data into the tables

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".

Get a list of all appointments along with patient name, doctor name, diagnosis, and cost (if available).

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

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

Demonstrate the following operations

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

II. 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

1. Count the number of students enrolled in each department.
2. Calculate the**average grade per course.**
3. List the **total number of courses taken by each student.**
4. Find the **highest and lowest grade** received in each course.
5. Get the **total number of students enrolled in each course.**
6. List all courses where the**average grade is greater than 75.**
7. Find students who have enrolled in **more than 5 courses.**
8. Display departments with **more than 100 students.**
9. Identify the course(s) with the **maximum enrollments** in a given semester.
10. Show students who have a **cumulative average grade greater than 80.**

III.	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.
IV.	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 one. 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.

Computer Networks			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPC303**	SEE Marks	**50**
Teaching Hours/Week (L: T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

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

Textbooks:

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

Internet of Things			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPC304**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

1. Provide knowledge on essential IoT networking components.
2. Impart knowledge on various IoT data formats and processing topologies.
3. Impart knowledge on infrastructure-level communication protocols.
4. Provide knowledge about secure key agreement and distribution techniques

Module 1: Emergence of IoT& IoT Sensing and Actuation	**No. of Hrs: 9**

Introduction, Evolution of IoT, IoT versus M2M, CPS, WoT, IoT Networking Components, Addressing Strategies in IoT, Address management classes, Addressing during node mobility, IoT Sensing and Actuation.
Text Book 1:Chapter 4, Chapter 5

Module 2: : IoT Processing Topologies and Connectivity Technologies	**No. of Hrs: 9**

Data Format, Processing Topologies, Processing Offloading, IEEE 802.15.4, ISA100.11A, Wireless HART, Near field communication, Sigfox, LoRa, NB-IoT, Wi-Fi, Bluetooth.
Text Book 1:Chapter 6, Chapter 7

Module 3: IoT Communication Technologies	**No. of Hrs: 8**

Infrastructure Protocols, RPL, 6LoWPAN, Content-centric networking (CCN), Message Queue Telemetry Transport, AMQP, XMPP, Simple Object Access Protocol, Representational state transfer, Identification Protocols, Device Management, Semantic Protocols.
Text Book 1:Chapter 8

Module 4: Security and Privacy in the IoT	**No. of Hrs: 8**

Security Issues in the IoT, Security Mechanisms Overview, Lightweight Cryptography, Symmetric-key LWC Algorithms, Public-key (Asymmetric) LWC Algorithms, Key Agreement, Distribution, Security Bootstrapping, Secure Data Aggregation, Privacy Issues, and IoT-OAS.
Text Book 2:Chapter 5

Module 5: Cloud and Fog Computing for the IoT	**No. of Hrs: 8**

Introduction, Virtualization, Cloud Models, Sensor-Cloud, Big Data Processing Pattern, Big Stream, Big Stream and Security, Fog Computing and the IoT, The Role of the IoT Hub.
Text Book 1:Chapter 10 ,Text Book 2:Chapter 6

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

1. Explain the key components of IoT networking architecture, including sensing and actuation.
2. Compare the capabilities and use cases of various wireless communication protocols.
3. Understand and explain the role of infrastructure protocols.
4. Identify and describe the security issues in IoT, including potential threats and vulnerabilities.
5. Explain the concept of Sensor-Cloud and its role in enabling scalable, sensor-driven data services.

Textbooks:

1. SudipMisra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. SimoneCirani, Gianluigi Ferrari, MarcoPicone, LucaVeltri, "Internet of Things Architectures, Protocols and Standards" John Wiley & Sons Ltd2019.

Reference Books:

1. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

Web links:

1. NPTEL Course Materials: https://onlinecourses.nptel.ac.in/noc22_cs53/preview

IoT Lab			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPC305**	SEE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:1:3**	Exam Hrs	**2.5**
Total Hours	**36**	Credits	**02**

Course Learning Objectives: This course is designed to

1. Impart knowledge on architecture, connections and working of Arduino board.
2. Provide knowledge on interfacing microcontrollers with sensors and other peripheral devices.

Lab Components:

Sl. No.	List of problems for which student should develop program and execute in the laboratory
1	Develop a program for controlling LED with a push button.
2	Develop a program to simulate the controlling of traffic lights.
3	a) Develop a program to demonstrate ODD-Even blinking of LEDs. b)Develop a program for fading of LEDs.
4	Develop a program for LDR interfacing and intensity control of LED.
5	Develop a program for potentiometer interfacing and intensity control of LED.
6	Develop a Smart Farm Irrigation System.
7	Develop a program to rotate servo motor in clockwise and anticlockwise direction for the given angle.
8	Develop a program to display room temperature on LCD.
9	Develop a program for Smart fire detection System.
10	Develop a program to calculate the distance of an object using ultrasonic sensor.
11	Develop a program to detect the collision using infrared sensor.
12	Develop a program to read the humidity and heat index print the readings on the serial monitor.

Course Outcomes: Students will be able to:

1. Interface sensors and actuators with microcontrollers for real-time data acquisition.
2. Understand the architecture, components, and communication protocols used in IoT systems.

Full Stack Development			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPE311**	SEE Marks	**50**
Teaching Hrs/Week(L:T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**52**	Credits	**03**

Course Learning Objectives: This course will enable students 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.
Chapter: 2,3,4 (Textbook 1)
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.
Chapter: 5,6 (Textbook 1)

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

Introduction to MERN: MERN components, Server-less Hello world program.
Chapter: 1 (Textbook 2)
React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition,

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
Chapter: 3,4 (Textbook 2)

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.
Chapter:5 (Textbook 2)

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

Node JS: Setting up Node.js, Call-backs 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
Chapter: 6(Textbook 2)

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 mouse over 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.
   Apply Node.js and MongoDB for backend development and data management.

Textbooks:

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

Reference Books:

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

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/

Machine Learning			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPE312**	SEE Marks	**50**
Teaching Hours/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, Big data Analytics and Types of Analytics, Big data 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 Modeling 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, Back propagation, 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.

Textbooks:

1. S Sridhar, M Vijayalakshmi, “Machine Learning”, OXFORD University Press 2021, First Edition.

Reference Books:

1. Murty, M. N., and V. S. Ananthanarayana. Machine Learning: Theory and Practice, Universities Press, 2024.
2. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
3. Burkov, Andriy. The hundred-page machine-learning book. Vol. 1. Quebec City, QC, Canada: AndriyBurkov, 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

FORMAL LANGUAGES AND AUTOMATA THEORY			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICPE313**	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 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 book1: Chapter 1.1, 1.5, Chapter 2.2, 2.3.1 to 2.3.5, 2.5, 4.4

Text book2: 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 book1: Chapter 3.1, 3.2.2, 3.2.3, 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 book1: Chapter 5.1, 5.2, 5.4, 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 book1: Chapter 7.1, 6.1 to 6.3.1, 6.4

Module 5: Introduction to Turing Machine and Undesirability	**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 book1: 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 toAutomata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2007.
2. Elaine Rich: Automata, Computability and Complexity, Theory and Applications, Pearsons Education,2018.

Reference Books:

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

Web link:

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

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

Course Learning Objectives: This course is designed to

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 Foot printing	**No. of Hrs: 8**

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.

Textbook1: **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

Textbook1: **Chapter 3**

Module 3: Enumeration	**No. of Hrs: 9**

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, Ldap Miner. SMTP Enumeration Tools- SMTP scan. General Enumeration Tools- NB Tscan, Unicornscan.
Textbook1: **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, Key logger and Spyware Countermeasures, Hiding Files, Rootkits, Rootkit Detection Tools, Steganography, Hiding the Data, Steganography Tools, Steganography Detection, Steganalysis Tools, Covering Tracks-Tools.
Textbook1: 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,
Textbook1: **Chapter 6**

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

1. Explain security fundamentals, ethical hacking, attack methods, and footprinting for ethical information gathering.
2. Perform network scanning, vulnerability assessment, and anonymization for risk identification and countermeasures.
3. Analyze the role of enumeration in identifying system vulnerabilities and apply appropriate mitigation techniques.
4. Examine system hacking techniques and implement corresponding defense mechanisms to secure systems.
5. Analyze penetration-testing methodologies for effective vulnerability assessment and mitigation.

Textbooks:

1. The Experts: EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Course Learning, Cengage Learning.

Reference Books:

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

Web links:

1. Ethical Hacking in 12 Hours - Full Course - Learn to Hack!: https://www.youtube.com/watch?v=fNzpcB7ODxQ
2. Ethical Hacking Full Course 2024 | Live: https://www.youtube.com/watch?v=uHU2uajL1EE
3. Ethical Hacking Full Course - Learn to Hack Fast!: .: https://www.youtube.com/watch?v=K6V7fc5Hj2s
   Ethical Hacking: https://archive.nptel.ac.in/courses/106/105/106105217/

Introduction To Database Management System			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICOE312**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

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, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inference Rules.

Text Book 1 Chapter 14.1 to 14.7, Chapter 15.1

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

SQL data types, DDL, DML and DCL, Specifying constraints in SQL, Basic retrieval queries in SQL, Nested and Correlated nested queries, Joined tables, outer joins, Aggregate functions, Assertions, Triggers Views.

Text Book 1 Chapter 6.1 to 6.4, Chapter 7.1 to 7.4

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

Introduction to Transaction Processing, Transaction and System concepts, ACID properties, Characterizing schedules based on serializability, Transaction support in SQL. Two-Phase Locking Techniques, Recovery Concepts, Shadow Paging, ARIES Recovery Algorithm.

Text Book 1 Chapter 20.1, 20.2.1, 20.3, 20.5.1, 20.5.2, 20.6, Chapter 21.1 .1, Chapter 22.1.3, 22.4, 22.5

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

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

Textbooks:

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

Reference Books:

1. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, McGraw Hill, 2014.
2. Silberschatz Korth and Sudharshan, Database System Concepts, 7th Edition, Mc-GrawHill, 2019.
3. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation Management, 10th Edition, Cengage Learning, 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. Transaction and Concurrency Control: https://www.youtube.com/watch?v=t5hsV9lC1rU

Java Programming			
Semester	**V**	CIE Marks	**50**
Course Code	**23ICOE313**	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. 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

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

Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Methods, Constructors, “this” Keyword, and Garbage Collection, Methods and Classes: Overloading Methods, Argument Passing, Objects as Parameters, Returning Objects, Recursion, Access Control, understanding static and final keywords, Nested and Inner Classes

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

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

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

Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter-thread Communication, Obtaining a Thread’s State, Enumerations, Type Wrappers and Autoboxing: Enumerations - The values() and valueOf() Methods, Type Wrappers - Character, Boolean, The Numeric Type Wrappers Autoboxing/Unboxing Occurs in Expressions, Autoboxing/Unboxing of Boolean, Character Values etc.,

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

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

Textbooks:

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

Reference Books:

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

Web links:

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

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

Course Learning Objectives: This course is designed to

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

Contents	**No. of Hrs: 13**

- Ashtanga Yoga
  1. Asana
  2. Pranayama
  3. Pratyahara
- Suryanamaskar13 count- 3 rounds of practice
- Asana its meaning by name, technique, precautionary measures and benefits of each asana
- Different types of Asanas
  a) Sitting
     1. Ardha Ushtrasana
     2. Vakrasana
     3. Yogamudra in Padmasana
  b) Standing
     1. UrdhvaHastothanasana
     2. Hastapadasana
     3. ParivrittaTrikonasana
     4. Utkatasana
  c) Prone line
     1. Padangushtha Dhanurasana
     2. Poorna Bhujangasana
  d) Supine line
     1. Sarvangasana
     2. Chakraasana
     3. Navasana/Noukasana
     4. Pavanamuktasana
- Revision of Kapalabhati practice 30 strokes/min 3 rounds
- Meaning by name, technique, precautionary measures and benefits of each Pranayama
  1. Ujjayi
  2. Sheetali
  3. Sheektari

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

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

Textbooks:

1. Ajitkumar ,"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 Book:

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 and Assessment:

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

Physical Education - III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC322**	SEE Marks	**-**
Teaching Hours/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hours	**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**

- Ethics in Sports & Moral Values in Sports and Games
- Sports Training Methods and its Impacts: Continuous Training, Interval Training, Circuit Training, Weight Training.
- FITT Implementing FITT principles to design personalized fitness programs. (Lectures & Practical Sessions)
- Specific Games (Students continue prior semester's game by practicing Intermediate Skills)

Basket Ball	Crossover dribble - Between-the-legs dribble - Bounce pass and no-look pass Shooting with form from mid-range - Defensive stance and footwork
Cricket	Advanced batting shots (cover drive, square drive, pull shot) - Swing and seam bowling variations - Fielding positions and strategies - Game sense and awareness
Football	Shielding the ball - Crossing the ball - Long passing and through balls - Tackling techniques (sliding & standing) - Shooting with power and accuracy - Playing different positions
Hockey	Stickhandling in tight spaces - Slapshot and sweep shot techniques - Passing with speed and accuracy - Dodging defenders - Defensive positioning and checking
Kabaddi	Advanced raiding techniques (frog jump, jump over) - Diverse raiding holds (frog kick, thigh hold) - Anticipation and countering defense - Effective raiding strategies - Advanced team defense formations
Karate	Kihon (repetition of basic techniques) - Kata (forms to practice technique and flow) - Combinations of punches and kicks - Footwork and movement - Basic kumite (sparring) techniques
Table Tennis	Looping technique (forehand and backhand) - Topspin and backspin serves - Footwork for attacking and defense - Blocking and countering techniques - Match strategy and tactics
Throwball	Long throws and bounce passes - Fake passes and deception moves - Dodging techniques to create space - Defensive positioning and guarding techniques - Team offense and set plays
Volleyball	Attack, Block, Service, Upper Hand Pass and Lower hand Pass

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

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

Textbooks:

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

Reference Books:

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

Web links:

1. https://www.youtube.com/watch?v=wvlztaJYKYI
2. https://www.youtube.com/playlist?list=PLHCNPOIaj2Wc8P5xAWq9g2DUrrbixoTOK
3. https://www.youtube.com/watch?v=K9X_wB1Yu84
4. https://www.youtube.com/watch?v=HEHggOOds1w&list=PLgVaM7Baa_8myp4njEDcoYyZkBq-542S5

Scheme & Assessment of students for auditing the course & Grades

SN	Activity	Marks
1	Participation of students	20
2	Quizzes-2, each of 15 marks	30
3	Final presentation/Exhibition/Participation in Competitions (Certificate of participation in National/International)	50
	Total	**100**

National Service Scheme - III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC323**	SEE Marks	
Teaching Hours/Week (L:T: P)	**0:0:1**	Exam Hrs	
Total Hours	**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

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

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.

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

Assessment details (CIE): Students will be assessed with the

Weightage	CIE
Participation of students	30 Marks
Individual contribution to success of the program	40 marks
Report preparation	30 Marks
Total marks	100 Marks

Arts - III			
Semester	**V**	CIE Marks	**100**
Course Code	**23NMCC324**	SEE Marks	**-**
Teaching Hours/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hours	**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 Acting Basics, Facial Expression Exercises, Body Language Camera Angles, Characterization demo and Practice, Individual Presentations, Evaluation.
Music	Orientation, Film Songs, Karaoke Singing, Rhythm Fusion and voice, Individual Presentation, song styles demo and practical, Evaluation.
Arts & Crafts	Orientation, Craft Forms, Paper Craft, Mask Making, Model Making, Thermocol Finger Puppet Making, Group Presentation, Evaluation.
Theatre	Orientation, Introduction to Theatre Sets and properties, Practical use of properti Set Designing, Costume Design, Headgears and Masks, Theatre Makeup, Evalua

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

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

Textbooks:

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

Reference Books:

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

Web links:

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

Scheme & Assessment of students for auditing the course & Grades		
SN	**Activity**	**Marks**
1	Students Participation	20
2	Quizzes-2 (each of 15 marks)	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**

Blockchain Technology			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPC306**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

1. Provide key elements of distributed system and Blockchain.
2. Provide concepts on Cryptocurrency and Bitcoin.
3. Provide insights into Ethereum, wallets, smart contracts, and DApps.
4. Provide knowledge on building DApps using smart contracts, and decentralized frameworks.

Module 1: Introduction	**No. of Hrs: 9**

Distributed systems, Characteristics, middleware, design goals, types of distributed systems. CAP theorem, Consensus. Introduction to Blockchain, Blockchain Architecture, Generic elements of a Blockchain, Blockchain Functionality benefits and features of a Blockchain, limitations of Blockchain technology, Types of Blockchain.

Textbook 1: Chapter1
Textbook 2:1.1,1.2,1.3

Module 2: Decentralization and Cryptography	**No. of Hrs: 9**

Methods of decentralization, full ecosystem decentralization: Smart contract, Autonomous agents, Decentralized organizations, autonomous organizations, autonomous corporations, autonomous societies, Decentralized applications, Decentralized web.

Cryptographic primitives: Symmetric cryptography: Introduction, Cryptographic primitives and Advanced Encryption standard. Asymmetric cryptography: Public and private keys, RSA, Digital signatures: RSA digital signature, Elliptic Curve Digital signature algorithm (ECDSA), Discrete log-based digital signature.

Textbook 1: 2, 3.1, 3.2, 4.2,4.3,4.4,4.5

Module 3: Bitcoin	**No. of Hrs: 9**

Introduction, Cryptographic keys, Transactions, coinbase transaction, The transaction life cycle, The transaction data structure, Types of transaction, The structure of a Bitcoin block , The genesis block, Stale and orphan blocks, Miners, Proof of Work, Mining Systems, The Bitcoin network, Wallets, Smart Contracts-Introduction, Definition, Ricardian contracts, Smart contract templates, Oracles, Deploying smart contracts on a Blockchain, The Decentralized Autonomous Organization (DAO).

Textbook 1:6.1, 6.2,6.4,6.5,6.6,6.7,6.8, and Chapter 8

Module 4: Ethereum	**No. of Hrs: 8**

Introduction, Cryptocurrency (ETH and ETC (Ethereum Classic), Keys and addresses, Accounts, Transaction and messages, Transaction components, Gas, State and Storage in the Ethereum Blockchain. The world state, Ethereum Virtual Machine. (EVM). The consensus mechanism, Forks in the Blockchain, Ethereum network, Wallet and client software, Supporting protocols.

Textbook 1: Chapter 9

Module 5: Hyperledger	**No. of Hrs: 7**

Introduction, Projects under Hyperledger: Distributed ledgers, Libraries, tools and domain specific projects, Hyperledger reference architecture, Hyperledger Design Principles, Hyperledger Fabric, Fabric 2.0

Textbook 1: 14.1, 14.2,14.3, 14.4

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

1. Explain the concepts of Distributed computing and its role in Blockchain Technology
2. Apply cryptographic techniques to mitigate Blockchain security challenges.
3. Design decentralized applications (DApps) using Ethereum, smart contracts, and Hyperledger frameworks.
4. Gain insights into Bitcoin's architecture, transactions, mining, smart contracts, and DAOs
5. Apply knowledge of Ethereum, EVM, consensus mechanisms for building smart contracts. .

Textbooks:

1. Imran Bashir. "Mastering Blockchain", Fourth Edition, Packt 2023
2. Maarten van Steen & Andrew S. Tanenbaum, Third Edition, 2018

Reference Books:

1. Andreas M., Mastering Bitcoin: Programming the Open Blockchain – O'rielly – 2017.
2. Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press, 2016.

Web links:

1. NPTEL Course Materials: https://nptel.ac.in/courses/106104220
2. Blockchain Technology Tutorial: https://www.geeksforgeeks.org/Blockchain/
3. Blockchain Technology Tutorial: https://www.tutorialspoint.com/Blockchain/index.htm

System Engineering			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPC307**	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. Impart Knowledge on the principles of physical system design, integration of sensors and actuators, communication protocols and power management techniques.
2. Impart knowledge on Data Modeling.
3. Provide knowledge on UI/UX design principles to develop effective hardware user interfaces and dashboards that support decision-making and business goals.
4. Provide knowledge on scalable system architectures for real-world applications by applying concepts of load balancing, database scalability, and distributed system design.

Module 1: Physical Design	**No. of Hrs: 06**

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: 05**

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: 05**

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 dashboards (operational, analytical, and strategic), effective dashboard design. Designing for business values: identifying business KPIs-custom dashboard design for business goals, creating value driven dashboard, measuring impact of dashboard design.

Module 4: Scalability	**No. of Hrs: 05**

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

Module 5: Case studies	**No. of Hrs: 05**

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.

Ethical Hacking			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPC308**	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. 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: 6**

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.

Textbook1: **Chapter 1, Chapter 2**

Module 2 : Scanning	**No. of Hrs: 5**

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

Textbook1: **Chapter 3**

Module 3: Enumeration	**No. of Hrs: 5**

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.

Textbook1: **Chapter 4**

Module 4: System Hacking	**No. of Hrs: 5**

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.

Textbook1: Chapter 5

Module 5: Penetration Testing	**No. of Hrs: 5**

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,

Textbook1: **Chapter 6**

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

1. Explain security fundamentals, ethical hacking, attack methods, and footprinting for ethical information gathering.
2. Perform network scanning, vulnerability assessment, and anonymization for risk identification and countermeasures.
3. Analyze the role of enumeration in identifying system vulnerabilities and apply appropriate mitigation techniques.
4. Examine system hacking techniques and implement corresponding defense mechanisms to secure systems.
5. Analyze penetration-testing methodologies for effective vulnerability assessment and mitigation.

Textbooks:

1. The Experts: EC-Council, “Ethical Hacking and Countermeasures Attack Phases”, Course Learning, Cengage Learning.

Reference Books:

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

Web links:

1. Ethical Hacking in 12 Hours - Full Course - Learn to Hack!: https://www.youtube.com/watch?v=fNzpcB7ODxQ
2. Ethical Hacking Full Course 2024 | Live: https://www.youtube.com/watch?v=uHU2uajL1EE
3. Ethical Hacking Full Course - Learn to Hack Fast!: .: https://www.youtube.com/watch?v=K6V7fc5Hj2s
4. Ethical Hacking: https://archive.nptel.ac.in/courses/106/105/106105217/

Project Phase-I			
Semester	**VI**	CIE Marks	**100**
Course Code	**23ICSE309**	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 member -Convener
    c. Project guide shall be the member
    d. One/Two senior faculty members nominated by the HOD (may be from different departments in case of an interdisciplinary project jointly nominated by the HODs)
4. Each project team shall consist of 2 to 4 students from the same department or different departments.
5. Interdisciplinary projects may be allowed with prior approval from the concerned HODs only.
6. Project teams must arrive at problem statements that address either real-world challenges or research-related issues relevant to their domain of study. Each team must formulate an appropriate project title in consultation with their project guide.
7. Each project team shall maintain a project dairy and record their project progress at regular interval of time. This shall carry signature of the students and the project guide.
8. There is no Semester End Examination (SEE) for this course and evaluation is based entirely on Continuous Internal Evaluation (CIE)
9. Marks may be equally or proportionally distributed among team members based on contribution assessed by the guide and committee.
10. A student shall obtain minimum of 40% of the total marks to pass this course
11. Plagiarism, data fabrication, or copying of work will result in stringent disciplinary action and /or penalties. (Note: Any disciplinary actions or penalties will be as per institutional policy.).

Deliverables:

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

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

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

Review and Evaluation:

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

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

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

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

Grand Total	**100 Marks**

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

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

1. Identify an engineering or research problem through a thorough review of relevant literature.
2. Design an appropriate solution or methodology to address the identified problem.
3. Prepare a comprehensive project report.
4. Effectively present each component of the project report to a knowledgeable audience.
5. Collaborate and contribute effectively as a team member, recognizing the dynamics of both individual and group work.

Cyber Security Lab			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPC310**	SEE Marks	**50**
Teaching Hours/Week (L:T:P)	**0:1:3**	Exam Hrs	**2.5**
Total Hours	**36**	Credits	**02**

Course Learning Objectives: This course is designed to

1. Provide practical, hands-on experience using various cyber security tools to identify and mitigate security risks.
2. Simulate and defend against different types of cyber attacks.
3. Equip students with the skills to detect, respond to, and recover from security breaches and incidents in a controlled environment.

Sl. No.	List of problems for which student should develop program and execute in the laboratory
1	**Experiment 1: Network Reconnaissance &Footprinting** Scenario: An organization, "TechSecure Corp," suspects that its internal LAN might contain devices with unpatched services. As an external consultant with limited initial knowledge, your first step is to gain intelligence about the network. You have been given a subnet range and must map out devices and open ports. Tasks: • Use Nmap for host discovery, port scanning, and service enumeration. • Employ Recon-ng or Amass for passive reconnaissance to discover hostnames, sub-domains, or metadata. • Document identified hosts, operating systems, and running services. Deliverable: A network inventory report listing IP addresses, OS guesses, and active services.
2	**Experiment 2: Vulnerability Scanning & Assessment** Scenario: After mapping the network, you have discovered a web server and a file-sharing server. Management wants a vulnerability assessment of these targets to identify known weaknesses before attackers can exploit them. Tasks: • Use OpenVAS to perform a comprehensive vulnerability scan on a Linux-based server (Metasploitable 2). • Run Nikto against the web application (e.g., DVWA) to find outdated server software, dangerous file uploads, or default credentials. • Assess the severity and relevance of each discovered vulnerability. Deliverable: A vulnerability assessment report with CVE references and risk ratings.
3	**Experiment 3: Exploiting a Known Vulnerability** Scenario: Your scan found a critical vulnerability on a target server (e.g., Metasploitable 2's vsftpd backdoor). The organization wants proof-of-concept exploitation to understand the potential damage if a malicious actor leverages this flaw. Tasks:

	• Use the Metasploit Framework to exploit the known vulnerability and obtain a shell. • Verify the level of access gained and the data potentially exposed. Deliverable: A screenshot and log of a successful exploit session, and notes on potential impact.
4	**Experiment 4: SQL Injection Attacks on Web Applications** Scenario: The DVWA application's login and search functionalities are suspected to lack proper input validation. The company needs confirmation that attackers can extract sensitive data using SQL injection. Tasks: • Use SQLMap against DVWA's vulnerable pages to enumerate databases, tables, and potentially user credentials. • Confirm that an attacker could retrieve confidential information from the backend database. Deliverable: Proof (screenshots/logs) of extracted database entries and a brief report on the risk to the Organization.
5	**Experiment 5: Cross-Site Scripting (XSS) Attacks** Scenario: The OWASP Juice Shop allows user-generated content. The security team suspects there is an XSS flaw that could lead to user session hijacking or credential theft. Tasks: • Inject a malicious JavaScript payload via a form or comment section using Burp Suite • Community Edition or OWASP ZAP to intercept and modify requests. • Demonstrate that the payload executes in a victim's browser (e.g., by producing an alert or stealing cookies). Deliverable: A screenshot of the XSS payload executing and a short explanation of the potential Consequences.
6	**Experiment 6: Password Cracking & Credential Harvesting** Scenario: From a previous SQL injection attack, you have obtained a list of hashed passwords. The concern is that weak passwords allow attackers to pivot within the network. Tasks: • Use John the Ripper or Hashcat to crack the obtained hashes. • Alternatively, if allowed, use Hydra to brute-force SSH or FTP logins on Metasploitable 2. • Evaluate how easily an attacker could escalate their access. Deliverable: A list of cracked passwords or confirmed account access, along with complexity recommendations.
7	**Experiment 7: Privilege Escalation on a Compromised Host** Scenario: You have a non-privileged shell on a compromised Linux server. The security team wants toknow if gaining full root access is feasible, helping them understand post-exploitation risks. Tasks:

	• Use LinPEAS or Linux Exploit Suggester to find local privilege escalation opportunities. • Exploit a vulnerable kernel or misonfigured SUID binary to become root. Deliverable: Evidence (screenshot of id command) that you obtained root privileges, and a short write-upof the exploited issue
8	**Experiment 8: Full Web Application Penetration Test** Scenario: You must perform a comprehensive test against the OWASP Juice Shop. The organization wants a detailed understanding of all web vulnerabilities before deployment. Tasks: • Use OWASP ZAP to spider and scan the application. • Identify various vulnerabilities (XSS, SQLi, broken authentication, insecure direct object references) and exploit them. • Summarize the findings and recommend remediations. Deliverable: A full web application penetration test report, including identified vulnerabilities, exploitation proofs, and remediation steps.
9	**Experiment 9: Man-in-the-Middle (MITM) Attack** **Scenario:** A security team at "TechSecure Corp" is evaluating the risk posed by unauthorized devices intercepting internal communications. To assess potential vulnerabilities, you are tasked with simulating a MITM attack on a local network segment. Understand how attackers could intercept or alter traffic between clients and servers without detection. **Tasks:** • Use Ettercap to perform ARP spoofing and establish a MITM position between two devices. • Capture and analyze network traffic using **Wireshark** to observe credentials or data in transit. • Attempt simple manipulations, such as redirecting web requests or injecting HTML into HTTP traffic. • Record observations on the types of data intercepted and any success in manipulation. Deliverable: A report detailing: The network topology used, Devices targeted and spoofed, Data captured (e.g., login credentials, session cookies), Countermeasures to mitigate MITM risks.
10	**Experiment 10: Phishing Simulations** **Scenario:** "TechSecure Corp" has recently experienced multiple reports of employees receiving suspicious emails. To test and improve employee awareness, the organization initiates a controlled phishing simulation. As part of the security team, your role is to design and execute a phishing campaign using legitimate tools in a safe, ethical environment. **Tasks:** • Use LUCY Security or GoPhish to design a phishing email campaign. • Create realistic phishing email templates mimicking common attack types (e.g., fake login pages, urgent password reset requests). • Monitor results including open rates, link clicks, and credentials submitted.

	Deliverable: A phishing simulation report including: The design and type of phishing emails sent, Campaign metrics (delivery rate, click rate, credential submissions), Screenshots or logs of user interactions, Recommendations for user training and policy improvements to reduce future phishing risks.

Course Outcomes: Students will be able to:

1. Recognize common cyber security threats and vulnerabilities in different types of systems and networks.
2. Simulate real-world attacks (e.g., SQL injections, phishing, XSS, etc) and apply defensive measures to mitigate them.
3. Use tools and techniques to assess vulnerabilities in web applications, networks, and databases.

Cryptography & Network Security			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPE321**	SEE Marks	**50**
Teaching Hours/Week (L:T: P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

Course Learning Objectives: This course is designed to

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

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

A model for Network Security, Classical encryption techniques: Symmetric cipher model, Substitution ciphers-Caesar Cipher, Mono alphabetic Cipher, Playfair Cipher, Hill Cipher, Poly alphabetic 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.

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 BlumShub 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

Chapter 8: 8.2 Chapter 9: 9.1, 9.2 Chapter 10: 10.1, 10.4

Module 3: Cryptographic 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

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.

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.

Chapter 20: 20.1, 20.2, 20.3, 20.4, 20.5

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

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

Textbooks:

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

Reference Books:

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

Web links:

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

CLOUD COMPUTING			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPE322**	SEE Marks	**50**
Teaching Hours/Week (L:T:P)	**3:0:0**	Exam Hrs	**3**
Total Hours	**42**	Credits	**3**

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

Module 1: Introduction to Cloud Computing	**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
Text book 1: Chapter 1: 1.1 to 1.4, Chapter 2: 2.2 to 2.4

Module 2: 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
Text book 1: Chapter 3: 3.1 to 3.6

Module 3: Cloud Computing Architecture	**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.
Text book 1: Chapter 4: 4.1 to 4.5Text book 2: 4.4, 4.5

Module 4: Cloud Security	**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
Text book 3: Chapter 9: 9.1 to 9.6, 9.8, 9.10
Text Book 2: Chapter 4: 4.6.1

Module 5: Cloud Platform in Industry	**No. of Hrs: 08**

Amazon web services: - Compute services, Storage services, Communication services, Additional services. Google AppEngine: - Architecture and core concepts, Application life cycle, Cost model, Observations, Microsoft Azure
Scientific applications case study: - HealthCare: ECG analysis in the cloud, Biology: gene expression data analysis for cancer diagnosis, Geo science: satellite image processing. Business and consumer applications: CRM and ERP, Social networking, media applications.
Textbook 1: Chapter 9: 9.1 to 9.3

Textbook 1: Chapter 10: 10.1 to 10.2

Course Outcomes:

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

1. Explain various cloud computing platforms 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.
2. Kai Hwang, Geoffrey C Fox, and Jack J Dongarra, Distributed and 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, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media.
2. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly Publication.
3. John Rhoton, Cloud Computing Explained: Implementation Handbook for Enterprises,

Web links:

1. Full course on Cloud Computing: https://nptel.ac.in/courses/106105167

Wireless and Mobile Device Security			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICPE323**	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. Provide knowledge on data communication, mobile technologies, and security challenges.
2. Inculcate an understanding of WLAN fundamentals, vulnerabilities, and threat scenarios.
3. Provide comprehensive insights into security measures of WLAN
4. Provide knowledge of mobile security challenges, device protection, and attack remediation

Module 1: Evolution of Data Networks and Mobile Communication	**No. of Hrs: 8**

The Evolution of Data Networks: Basics of Data Communication, Wired to Wireless; Business Challenges Addresses by Wireless Networking, The Wi-Fi Market, The Internet of Things.
Introduction to Mobile Communication: Cellular Coverage Maps, Cellular Handoff, Evolution of Mobile Networks, Economic Impact of Mobile IP; Business Impact of Mobility, Business use cases.
Threats Overview: Threat Categories, Threats to Wireless and Mobile Devices, Risk Mitigation, Authorization and Access Control, Information Security Standards, Regulatory Compliance.
Text book 1: Chapter 1, 2, 4

Module 2: WLAN Fundamentals and Threat Analysis	**No. of Hrs: 9**

WLAN Fundamentals: WLAN Topologies, The 802.11 Standards, Wireless Access Points (WAPs) ,Wireless Bridges, Wireless Antennas
WLAN and IP Networking Threat and Vulnerability Analysis: Types of Attackers, Targets, Physical Security and Wireless Networks, Social Engineering, Wardriving, Rogue Access Points, Bluetooth Vulnerabilities; Malicious Data Insertion on Wireless Networks, Denial of Service Attacks, and Peer to Peer Hacking over Ad Hoc Networks;
Text book 1: Chapter 5, 6

Module 3:WLAN Security Measures	**No. of Hrs: 8**

Basic WLAN Security Measures: Design and Implementation Considerations for Basic Security; Authentication and Access Restriction; Data Protection; Ongoing Management Security Considerations.
Advanced WLAN Security Measures: Establishing and Enforcing a Comprehensive Security Policy; Implementing Authentication and Access Control, Data Protection, User Segmentation, Managing Network and User Devices.
Text book 1: Chapter 7, 8

Module 4:WLAN Auditing Tools and Risk Assessment	**No. of Hrs: 8**

WLAN Auditing Tools: WLAN Discovery Tools, Penetration Testing Tools, Password Capture & Decryption Tools, Network Management & Control Tools, WLAN Hardware Audit Tools and Antennas, Attack Tools & Techniques, Network Utilities.
WLAN and IP Network Risk Assessment: Risk Assessment, IT Security Management, Security Risk Assessment Stages, Security Audits.
Text book 1: Chapter 9,10

Module 5: Mobile Security Challenges, Models, and Remediation Techniques	**No .of Hrs: 9**

Mobile Communication Security Challenges: Mobile Phone Threats & Vulnerabilities, Exploits- Tools and Techniques, Google Android Security Challenges, Apple iOS Security Challenges, Windows Phone Security Challenges
Mobile Device Security Models: Google Android Security, Apple iOS Security, Windows Phone Security, Security Challenges of Hand-Off type Features, BYOD and Security, Security using Enterprise Mobile Management
Mobile Wireless Attacks and Mobile Remediation: Scanning the Corporate Network for Mobile Attacks, Client & Infrastructure Exploits, Network Security Protocol Exploits, Mobile Software Exploits and Remediation
Text book 1: Chapter 11,12,13

Course Outcomes: Students will be able to:

1. Compare the evolution of wired and wireless communication networks, their business impact, and associated security challenges.
2. Explain WLAN fundamentals and assess security threats in wireless and IP networks.
3. Identify various WLAN security measures, such as authentication, access control, and data protection.
4. Develop strategies to mitigate risks in mobile and wireless communication systems

Text book:

1. J. Doherty, Wireless and Mobile Device Security. Jones & Bartlett Learning, 2nd edition Dec. 2021.

Reference Books:

1. M. S. Obaidat, A. Anpalagan, I. Woungang, and S. Misra, Security and Privacy in Wireless and Mobile Networks. MDPI, 2021.
2. M. Zinkus, T. M. Jois, and M. Green, "Data Security on Mobile Devices: Current State of the Art, Open Problems, and Proposed Solutions," arXiv, 2021. [Online]. Available: https://arxiv.org/abs/2105.12613
3. J. Stevenson, Mobile Offensive Security Pocket Guide: A Quick Reference Guide for Android and iOS. Independently Published, 2022.

Web links:

1. Wireless and Mobile Security Concepts: https://youtu.be/A59TS2zhmrw?si=TQ0dHkbcwmxsz9Ov

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

Course Learning Objectives: This course is designed to

1. Provide insights about the basic principles, methodologies, and tools used in computer forensics to investigate digital crimes.
2. Impart the various data acquisition methods, understand storage formats, and utilize appropriate tools to collect and analyze digital evidence effectively.
3. Equip the ability to navigate through the legal frameworks, privacy concerns, and ethical issues surrounding computer forensics, ensuring adherence to laws and professional standards during investigations.
4. Improve the knowledge about the processing of digital evidence from the incident scenes.
5. Introduce the process involved in hand held device forensics.

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

Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital evidence, Digital Forensics Lifecycle, Chain of custody concept, Approaching a Computer Forensics Investigation, Relevance of the OSI 7 Layer Model to Computer forensics, Challenges in Computer Forensics: Technical and Legal Challenges.

Text Book 1 : **Chapter 7.2-7.5, 7.7, 7.8, 7.10, 7.13, 7.16**

Module 2 : Computing Investigations	**No. of Hrs: 9**

Preparing a Computer Investigation: An Overview of a Computer Crime, An overview of a Company Policy Violation. Systematic Approaches: Assessing the case, Planning the Investigation, Securing the Evidence, Procedure for corporate High-Tech investigations, Interviews and Interrogations in High-Tech, Understanding Data Recovery Work Station and Software: Setting a workstation for Computer Forensics, Conducting an Investigation: Gathering the Evidence, Understanding Bit-Stream Copies, Acquiring an Image of Evidence Media and completing the Case.

Text Book 2: Chapter 2

Module 3: Data acquisition	**No. of Hrs: 8**

Understanding storage formats and digital evidence: Raw format, Proprietary Formats, Advanced Forensic Format. Determining the Best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisitions, Performing RAID Data Acquisitions, Remote network acquisition tools, Other forensics acquisitions tools.

Text Book 2:Chapter 4

Module 4: Processing Crimes and Incident scenes	**No. of Hrs: 8**

Identifying Digital Evidence: Understanding Rules of Evidence, Collecting Evidence in Private-Sector Incidence Scenes, Processing Law Enforcement Crime Scenes, Preparing for a Search, Securing a Computer Incident or Crime Scene, Seizing Digital Evidence at the Scene, Storing Digital Evidence, Obtaining Digital Hash, Reviewing a Case. Report Writing for High-Tech Investigations: Types of Reports, Guidelines for Writing Reports.

Text Book 2:Chapter 5, Chapter 14

Module 5: Forensics of Hand-Held Devices	**No. of Hrs: 9**

Handheld devices and digital Forensics: Mobile phone Forensics, PDA Forensics, Printer Forensics, Scanner Forensics, Smartphone Forensics, Challenges in Forensics of the Digital Images and Still Camera, Toolkits for Hand-Held Device Forensics: Encase, Device Seizure and PDA Seizure, Palm DD, Forensics Card Reader, Cell Seizure, MOBILedit, ForensicSIM. Techno-Legal Challenges with Evidence from Hand-Held Devices: Role of Computer Forensics in Litigations, Challenges Due to Forensics Validity Issues about Evidences, Challenges to Law Enforcement Authorities.

Text Book 1:Chapter 8.3:8.3.1- 8.3.5, 8.3.7, 8.4:8.4.1-8.4.7, 8.7: 8.7.1-8.7.3

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

CO1. Explain the foundational principles, investigation processes, and key challenges involved in digital forensics for computer-based investigations.

CO2. Describe the procedures for planning and conducting corporate digital investigations, including incident scene protection and the seizure of digital evidence.

CO3. Identify and explain various data recovery workstations, acquisition methods, and tools used for RAID systems and remote network data acquisition.

CO4. Explain methods for storing, validating, and preserving digital evidence, including the role of digital hashing in ensuring evidence integrity.

CO5. Explain the fundamentals, commonly used tools, and techno-legal challenges of handheld device forensics in the context of digital evidence investigation.

Textbooks:

1. Nina Godbole, Sunit Belapure," Cyber Security : Understanding Cyber Crimes, Computer Forensics and Legal Perspectives",Wiley,2011, ISBN: 978-81-265-2179-1
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 4e ., Cengage Learning, 2014, ISBN: 978-81-315-1946-2.

Reference Books:

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

Web links:

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

Introduction to Machine Learning			
Semester	**VI**	CIE Marks	**50**
Course Code	**23CSOE322**	SEE Marks	**50**
Teaching Hrs/Week(L:T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives: This course is designed to

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

Module1: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

Module2: 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

Module3: 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

Module4: Classification	**No. of Hrs:9**

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

Module5: 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.

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

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

Textbooks:

1. TomM. Mitchell, "Machine Learning", McGrawHill,2003.
2. Jason Brownlee: Data Preparation for Machine Learning: Data Cleaning, Feature Selection, and Data Transforms in Python, 2020,
3. Manaranjan Pradhan, U Dineshkumar, "Machine Learning using Python", Wiley,2019
4. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 2ndEdition, O'Reilly Publisher, 2019

Reference Books:

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

Web links:

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

Introduction to Data Science			
Semester	**VI**	CIE Marks	**50**
Course Code	**23ICOE323**	SEE Marks	**50**
Teaching Hrs/Week(L:T:P)	**3:0:0**	Exam Hrs	**03**
Total Hrs	**42**	Credits	**03**

Course Learning Objectives: This course is designed to

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

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

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

Module2: 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

Module3: 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

Module4: 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

Module5: Data Visualization & Fraud Detection	**No. of Hrs:10**

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

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

1. Understand and apply core data science concepts in practical scenarios.
2. Describe and summarize data using statistical methods such as inference and modeling.
3. Use regression, classification, and clustering techniques to analyze relationships in data.

4. Implement data wrangling, feature engineering, and machine learning models using R.
5. Develop and apply data visualization techniques for better data-driven decision-making.

Textbooks:

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

Reference Books:

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

Web links:

1. NPTEL course on Data Science: https://archive.nptel.ac.in/courses/106/106/

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

Course Learning Objectives: This course is designed to

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

Contents	**No. of Hrs: 13**

- Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi
- Asana by name, technique, precautionary measures and benefits of each asana
- Suryanamaskar13 count- 4 rounds of practice
- Different types of Asanas
  a) Sitting
     1. Bakasana
     2. Hanumanasana
     3. Ekapada Rajakapotasana
     4. Yogamudra in Vajrasana
  b) Standing
     1. Vatayanasana
     2. Garudasana
  c) Balancing
     1. Veerabhadrasana
     2. Sheershasana
  d) Supine line
     1. Sarvangasana
     2. Setubandha Sarvangasana
     3. Shavasanaa (Relaxation posture).
- Revision of Kapalabhati practice 40 strokes/min - 3 rounds
- Meaning by name, technique, precautionary measures and benefits of Pranayama Bhramari.

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

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

Textbooks:

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

Reference Book:

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 and Assessment:

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

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

Course Learning Objectives: This course is designed to

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

Contents **No. of Hrs: 13**

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

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

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

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

Textbooks:

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

Reference Books:

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

Web links:

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

Scheme & Assessment of students for auditing the course & Grades

SN	Activity	Marks
1	Participation of students	20
2	Quizzes-2, each of 15 marks	30
3	Final presentation/Exhibition/Participation in Competitions (Certificate of participation in National/International)	50
	Total	**100**

National Service Scheme - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC327**	SEE Marks	**-**
Teaching Hours/Week (L:T: P)	**0:0:1**	Exam Hrs	**-**
Total Hours	**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

NSS -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:

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

Assessment details (CIE): Students will be assessed with the	
Weightage	CIE
Participation of students	30 Marks
Individual contribution to success of the program	40 marks
Report preparation	30 Marks
Total marks	100 Marks

Arts - IV			
Semester	**VI**	CIE Marks	**100**
Course Code	**23NMCC328**	SEE Marks	**-**
Teaching Hours/Week (L: T: P)	**0:0:1**	Exam Hrs	**-**
Total Hours	**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.
Music	Orientation, Western Songs, Voice Culture, Voice Modulation, Rap Singing, Folk Song Revision, Film Song Revision, Group Presentation Evaluation
Arts & Crafts	Orientation, Puppetry: Glow Puppetry- Head Puppets -Animal Puppetry -POP Puppetry- Group Presentation- Evaluation
Theatre	Orientation, Theatre Music, Theatre Choreography, Script Writing, Group Production, Grand Rehearsals, Group Show, Evaluation.

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

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

Textbooks:

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

Reference Books:

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

Web links:

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

Scheme & Assessment of students for auditing the course & Grades		
SN	**Activity**	**Marks**
1	Students Participation	20
2	Quizzes-2 (each of 15 marks)	30
3	Final presentation/Exhibition/Participation in Competitions	50
	Total	**100**