BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Avalahalli, Yelahanka, Bengaluru 560064

Bachelor of Engineering

Department of Information Science and Engineering

V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous

Approved in the BoS meeting held on 25.05.2023

Vision:

Emerge as Centre of learning in the field of information science & engineering with technical competency to serve the society.

Mission:

To provide excellent learning environment through balanced curriculum, best teaching methods, innovation, mentoring and industry institute interaction.

Program Educational Objectives (PEOs)

PEO-1: Successful professional career in Information Science & Technology.

PEO-2: Pursue higher studies to persist knowledge in IT industry.

PEO-3: Exhibit professionalism and team work with social concern.

Program Specific Outcomes (PSOs)

PSO 1: Apply the Knowledge of Information technology to develop software solutions.

PSO 2: Design and develop hardware systems, manage and monitor resources in the product life cycle.

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

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Yelahanka, Bengaluru-560064

Date: 14.06.2023

CIE and SEE Pattern for 2021 Scheme
(Applicable from the AY 2021-22 onwards)

Important Note:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examinations (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for SEE minimum passing mark is 35% of the maximum marks (18 marks out of 50). The student is declared as a pass in the course if he / she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

4 CREDIT and 3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs to be conducted for 40 Marks (90 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10 marks, total **20 marks**.
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (3 hours).

Question Paper Pattern:

Part - A: Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.

Part - B: There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question from each module.**

SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.

2 CREDIT COURSES

I. **CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS**

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. **SEMESTER END EXAMINATIONS (SEE): 50 MARKS**

SEE is conducted for 100 Marks (2 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 100 questions each of 01 marks. The same is scale down to 50 marks.

1 CREDIT COURSES

I. **CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS**

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks.**
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks.**
- Assignments: 2 assignments of each 10marks, total **20 marks.**
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks.**
- Student has to score minimum of 20 marks (40%).

II. **SEMESTER END EXAMINATIONS (SEE): 50 MARKS**

SEE is conducted for 50 Marks (1 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 50 questions each of 01marks. The same is scale down to 50 marks.

1 CREDIT LABORATORY COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Cumulative Assessment (CA) of each experiment is 20 Marks (Conduction 10 marks + Records 5 marks +Viva 5marks). The average of all the experiments to be taken for **20 marks.**
- Open Ended Experiments (OE) **10 marks.**
- 2 IAs Test to be conducted for 100 marks. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks. The average of 2 IA marks is scale down to **20 marks**.
- CIE marks =20 (CA) +10 (OE) + 20 (IA test) = 50 marks.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks and scale down to 50 Marks.

Examinations to be conducted jointly by Two examiners. All the experiments are to be included for practical examination. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks.

CoE 16/06/2023 Dean AA 16/06/2023 Principal 19/6/23

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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Scheme of Teaching and Examination: Effective from AY 2023– 24Choice Based Credit System (CBCS)

UG PROGRAM: Department of Information Science and Engineering (ISE) — **Semester: V**

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS51	Management and Entrepreneurship	ISE	3	0	0	0	3	3	50	50	100
2	AEC	21AEC52	Cyber and Intellectual Property law	ISE	1	0	0	0	1	1	50	50	100
3	INT	21INT53	Innovation / Entrepreneurship / Societal Internship	ISE	0	0	0	6	3	-	100	-	100
4	PE	21IS54X	Professional Elective I	ISE	3	0	0	0	3	3	50	50	100
5	PC	21CS55	Data Base Management Systems	ISE	3	0	0	0	3	3	50	50	100
6	PC	21CS56	Operating Systems	ISE	2	1	0	0	3	3	50	50	100
7	PC	2ICS57	Data Communication and Networks	ISE	3	0	0	0	3	3	50	50	100
8	PC	21CSL58A	Database Management Systems Laboratory	ISE	0	0	2	0	1	3	50	50	100
9	PC	21CSL58B	Operating Systems Laboratory	ISE	0	0	2	0	1	3	50	50	100
10	PC	21CSL58C	Data Communication and Networks Laboratory	ISE	0	0	2	0	1	3	50	50	100
TOTAL					15	1	6	6	22		550	450	1000

Professional Elective - Group I	
Course Code	Course Title
21IS541	Cryptography and Network Security
21IS542	Data Science
21IS543	Systems for IoT
21IS544	Human Computer Interface
21IS545	Computer Graphics and Visualization

BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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Scheme of Teaching and Examination: Effective from AY 2023– 24Choice Based Credit System (CBCS)

UG PROGRAM: Department of Information Engineering (ISE) — **Semester: VI**

Sl. No	Course Category	CourseCode	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration in Hours	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS61	Project and Finance Management	ISE	2	0	0	0	2	2	50	50	100
2	AEC	21AEC62	Bio Informatics	ISE	1	0	0	0	1	1	50	50	100
3	AEC	21IS63	Green IT and Sustainability	ISE	1	0	0	0	1	1	50	50	100
4	PE	21IS64X	Professional Elective II	ISE	3	0	0	0	3	3	50	50	100
5	OE	21IS65X	Open Elective I	ISE	3	0	0	0	3	3	50	50	100
6	PW	21IS66	Mini Project	ISE	0	0	0	4	2	3	50	50	100
7	PC	21IS67	Machine Learning	ISE	3	0	0	0	3	3	50	50	100
8	PC	21IS68	Cloud Computing	ISE	3	0	0	0	3	3	50	50	100
9	PC	21IS69A	Mobile Application Development Laboratory	ISE	0	0	2	0	1	2	50	50	100
10	PC	21IS69B	Cloud Computing Laboratory	ISE	0	0	2	0	1	2	50	50	100
11	PC	21IS69C	Machine Learning Laboratory	ISE	0	0	2	0	1	2	50	50	100
TOTAL					16	0	6	4	21		550	550	1100

Professional Elective - Group II	
Course Code	Course Title
21IS641	Cyber security and Digital Forensic
21IS642	Data Analytics
21IS643	Distributed Database System
21IS644	Advanced Java Programming
21IS645	Computer Vision

Open Elective (OE) - Group I	
CourseCode	Course Title
21IS651	Data structures and Algorithms
21IS652	OOC using Java
21IS653	Introduction to Operating Systems
21IS654	Software Engineering
21IS655	Introduction to Python Programming

Syllabus of V Semester

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER - V

Management and Entrepreneurship (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	**21HSS51**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course objectives:

This course will enable students to:

1. Define the strategic, tactical, and operational roles and functions of management.
2. Use critical thinking to formulate and execute managerial entrepreneurial strategies, plans, and procedures.
3. Understand the Ideation Process, creation of Business Model, Feasibility Study and sources of funding

Module – 1

Management: Significance and Scope of Management, Importance of the management and entrepreneurship in Economic growth of Nation, Impact of the entrepreneurship on Societal Problems for Sustainable Solutions. Management in the perspective of National Economy, Career, Innovations and trends. Definition, Management functions, Levels of management, Roles of manager, Managerial skills, Management & Administration.

Planning: Importance, Types, Steps and Limitations of Planning; Decision Making types and Steps in Decision Making.

(8 Hours)

Module – 2

Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management, Departmentalization.
Committees: Meaning, Types of Committees; Centralization Vs Decentralization of Authority, Responsibility. Staffing: Importance, Recruitment and Selection Process.
Directing and Controlling: Meaning and Requirements of Effective Direction.
Motivation: Nature of Motivation, **Motivation Theories** (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory). **Communication:** Meaning, Importance and Purposes of Communication. **Leadership:** Meaning, Characteristics, Behavioral Approach of Leadership. **Coordination:** Meaning, Types, Techniques of Coordination; **Controlling:** Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, and Steps in Control Process.

(8 Hours)

Module – 3

Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. Theories of Entrepreneurship.

(8 Hours)

Module – 4

Entrepreneurial Project Development: Idea Generation and Feasibility Analysis- Idea Generation; Creativity and Innovation; Identification of Business Opportunities; Market Entry Strategies; Marketing Feasibility; Financial Feasibilities; Political Feasibilities; Economic Feasibility; Social and Legal Feasibilities; Technical Feasibilities; Managerial Feasibility, Location and Other Utilities Feasibilities.
(Case study/Activity to demonstrate entrepreneurial abilities)

(8 Hours)

Module – 5

Social Responsibilities of Business: Meaning of social responsibility, social responsibilities of business towards different groups, social audit, business ethics and corporate governance.
Self-study topics:

1. Sources of funding, Working capital management and Taxation benefits.
2. Market evaluations and turnaround strategies.
3. Policies governing SME's
4. Perform market survey on sectors promoted by the government and submit the report for the same.

Summary: The student will explore entrepreneurial opportunities and gather all relevant data for starting a venture.

(8 Hours)

Course outcomes:

The students will be able to:

CO1: Comprehend the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business

CO2: Categorize the functions of Managers, Entrepreneurs and their social responsibilities

CO3: Analyze the business environment components in developing a business plan.

CO4: Individually and in teams identify, conceptualize, and develop solutions for successful entrepreneurial management.

Textbooks:

1. P. C. Tripathi., P. N. Reddy., "Principles of Management." 6th Edition, McGraw-HillEducation, 2017.
2. Dr. Vasant Desai. "Dynamics of Entrepreneurial Development and Management", 6th Edition, Himalayan Publishing House, 2019.

References:

1. Poornima. M. Charantimath., "Entrepreneurship Development Small BusinessEnterprises", Pearson Education, 2008.
2. Robert. D. Hisrich., Mathew. J., Manimala., Michael. P. Peters., Dean. A., Shepherd, "Entrepreneurship", 8th Edition,Tata McGraw Hill Publishing Co. ltd, 2012.
3. Harold Koontz, Heinz Weihrich., "Essentials of Management: An International, Innovation and Leadership perspective", 10th Edition, McGraw Hill Education, 2016.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

Semester – V

Cyber and Intellectual Property Law (0:2:0)1

(Common to all Branches)

(Effective from the academic year 2023-24)

Course Code	**21AEC52**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:2:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	1

Course Objectives:

This course will enable students to:

1. Understand the concept of IP, copyright, patent and its protection.
2. Explain the scope of trademarks, industrial and IC layout design.
3. Enhance their knowledge on IP management and related agreements.
4. Understand overview of Cyber law and cyber policies.
5. Identify different types of cybercrime and security measures.

Module – 1

Introduction to IP: Various forms of IP, Intellectual property verses physical property, importance of intellectual property.

Copyright: Different classes of copyright work, ownership of copyright, term of copyright, infringement of copyright.

Patent: Fundamentals of patent, condition for grant of patent, inventions those are not patentable, right of patentee, transfer of patent right, Infringement of patent right, challenges in patents. Case study on prior art search and patent drafting. (03 Hours)

Module – 2

Trademarks: Introduction to trademark, developing trademark, term of trademark, collective marks, certification trademarks, Infringement of trademark.

IC Layout Design Introduction to Semi-Conductor Integrated Circuits Layout, The Semi-Conductor Integrated Circuits Layout Design (SICLD) Act, 2000.

Industrial Design: Design registration, Industrial design act 2000.

Case study on infringement of Industrial Design (03 Hours)

Module – 3

Creating IP: Need for creating IP, Process of development of IP and knowledge.

TRIPS (Trade-Related aspects of IPR): Need and objectives, Agreement on trip, scheme of agreements. WIPO: Objectives, functions, memberships

Treaties: Patent cooperation Treaty(PCT)**:** filing patent under PCT, Different stages and procedure in PCT filing. Paris Convention Treaty**:** filing patent under Paris convention treaty, Different procedure stages

IP Management: Defining IP management, need and importance of IP management,

. Undertaking IP intelligence, acquisition of IP, managing IP portfolio, commercialisation of IP, protecting IP. Case studies on PCT filing. (03 Hours)

Module – 4
Cyber Law: introduction to Indian cyber law, need for cyber law, jurisprudence of cyber law, importance of cyber law. **IT Act:** Objective and scope of The Indian Information Technology Act 2000. **Cyber Crimes**: What constitute cyber crime, Important cybercrimes. C**yber policies:** Need for an information security policy, information security standard-ISO, introduction to various security policies. Case study on cyber crime. (03 Hours)
Module – 5
Phishing; Sspear phishing, protecting from phishing attack, cyber stalking, how to prevent cyber stalking. **Hacking**: types, Protection of computers from intrusion and types, different types of hackers and their operation. **Data theft**: IT act related to data theft, Spam E-mail, IT act related to spam mail, Software piracy, types, legal penalties, Identity theft, prevention practice **Electronic and digital signature:** Role of electronic signature, types of electronic signature,guidelines for electronic signature. Creation of digital signature, digital signature in India. (03 Hours)
Course Outcomes: The students will be able to: CO1: Describe the concept of copyright and patent and its protection. CO2: Explain the scope of trademarks, industrial and IC layout design. CO3 Describe Intellectual property management and related agreements. CO4: Understand overview of Cyber law and cyber policies. CO5: Discuss different types of cybercrime and security measures.
Text Books
1. V Appukutty, Cyber Crime & Law, Coral Publishers, 2022 2. Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla, Introduction to information Security and Cyber Laws, Dream Tech Press,2021 3. Neeraj Pandey, Khushdeep Dharni, Intellectual Property Rights, PHI Learning, 2014
References
Prabhuddha Ganguli, Intellectual Property Rights, Tata Mc-Graw –Hill, 2017 S R Myneni, Patent Right Creation and Registration, Asia Law House, 2017 Marjie T. Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson, 3rd Edition, 2004. Bill Nelson, Amelia Phillips, Christopher Steuart, Guide to Computer Forensics and Investigations, Cengage Learning, 4th Edition, 2010.

	ASSESSMENT METHODS **CIE Components** (50 Marks) Three Unit Tests each of 40 Marks (duration 01 hour) Two Assignment : 20 Marks Two AATs : 20 Marks Sum of the Assignment and AATs will be out of 40 Marks and scaled down to 20 Marks

	Sum of the three Internal Assessments Tests Marks will be out of 120 Marks and scaled down to 30 Marks i.e. Internal Assessments Tests : 30 Marks Assignment and AAT : 20 Marks Total CIE Marks : 50 Marks **Semester-End Examination**(50 Marks) • SEE question paper will be set for 50 questions of each of 01 marks • The pattern of the question paper is MCQ. **Assessment Details** (both CIE and SEE): • The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. • The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). • The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). • A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures not less than 35% (18 Marks out of 50) in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER –V

Data Base Management System (3:0:0) 3

Common to CSE/ISE

(Effective from the academic year 2023-24)

Course Code	**21CS55**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable the students to:

1. Provide a strong foundation in database concepts, technology and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in database.
4. Develop Database applications for real world problems.

Module – 1

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. **Overview of Database Languages and Architectures**: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. **Conceptual Data Modelling using Entities and Relationships:** Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, **ER** diagrams, examples, Specialization and Generalization.

Textbook 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10 RBT: L1, L2, L3

(8 Hours)

Module – 2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. Textbook 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1; Textbook 2: 3.5 RBT: L1, L2, L3

(8 Hours)

Module – 3

SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL. Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop. **Internet Applications**: The three-Tier application architecture, The presentation layer, The Middle Tier

Textbook 1: Ch7.1 to 7.4; Textbook 2: 6.1 to 6.6, 7.5 to 7.7. RBT: L1, L2, L3

(8 Hours)

Module – 4

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: 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. **Normalization Algorithms:** Inference Rules, Equivalence, and Minimal Cover, Properties of Relational Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms

Textbook 1: Ch14.1 to 14.7, 15.1 to 15.6 RBT: L1, L2, L3

(8 Hours)

Module – 5

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. **Concurrency Control in Databases**: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking. **Introduction to Database Recovery Protocols**: Recovery Concepts, NO-UNDO/REDO recovery based on Deferred update, Recovery techniques based on immediate update, Shadow paging, Database backup and recovery from catastrophic failures

Textbook 1: 20.1 to 20.6, 21.1 to 21.7, 22.1 to 22.4, 22.7. RBT: L1, L2, L (8 Hours)

Course outcomes:

The students will be able to:

CO1: Make use of DBMS Languages to write the Queries.**(K2)**

CO2: Apply the concepts of ER modelling and relational algebra for solving a problem.**(K3)**

CO3: Analyze data requirements and design a database using RDBMS concepts.**(K4)**

CO4: Appraise the need for normalization, and transaction management in fully developed DBMS. **(K5)**

CO5: Develop an Database Application using any database tool **(K6)**

Textbooks:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

References:

1. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.

2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER –V

Operating Systems (3:0:0) 3

(Effective from the academic year 2023 -2024)

Course Code	**21CS56**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

Recognize the importance of the operating systems.

Recognize how the applications interact with the operating system as the later working as intermediary program between the machine and the application.

Understand how operating systems managing resources such as processors, memory and I/O.

Preamble

Operating systems are the fundamental part of every computing device to run any type of software. The increasing use of computing devices in all areas of life (leisure, work), lead to a variety of operating systems. Yet all operating systems share common principles. These principles are important for computer science students in their understanding of programming languages and software built on top of operating systems.

This course will be discussing about address spaces, system call interface, process/threads, inter process communication, deadlock, scheduling, main memory, virtual memory and file systems.

Module – 1

Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.

Operating systems Introduction: Evolution of OS; Operating System operations; Resource Management; Protection and Security; Distributed system; Kernel Data Structures; Open-Source Operating Systems.

OS Structures: OS services-User and OS Interface- Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation – OS structures.

(9Hours)

Module – 2

Process Management: Process Concept - Process Scheduling - Operations on Processes Process Scheduling; Scheduling Criteria; Scheduling Algorithms.

Process Synchronization: The critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization (8Hours)

Module – 3

Deadlocks: Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Memory Management -I: Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. Segmentation with paging; (8Hours)

(8 Hours)

Module – 4

Virtual Memory management: - Demand Paging; Page Replacement - Allocation of Frames – Thrashing.

Mass Storage Management: Disk Structure – HDD scheduling; Swap space Management;

File system: Access methods; Directory Structure; Allocation Methods; Free space management.

Module – 5

Virtual Machines and Mobile OS – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Virtualization Research

Mobile OS - iOS and Android. **Recap/Summary** of the Course

(8 Hours)

Course Outcomes: The students will be able to:

CO1: Describe the structure of OS and basic architectural components involved in OS.

CO2: Analyze various resource management techniques.

CO3: Apply the concepts to solve scheduling and allocation problems

CO4: Demonstrate the Deadlock, file system and virtualization concepts.

Compare iOS with Android

Textbooks:
1. Silberschatz, Galvin, Gagne, Operating System Concepts, John Wiley, 10th Edition, 2018. 2.Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.
References:
1.William Stallings, Operating Systems: Internals and Design Principles -, Prentice Hall, 7th Edition 2018. 2.Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Communication and Networks (3:0:0) 3

(Effective from the academic year 2023 -2024)

Course Code	**21CS57**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

This course will enable students to:

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Analyze error detection and correction techniques along with mechanisms for Media Access control
3. Examine internet protocols and compare different routing algorithms.
4. Distinguish between connection oriented and connectionless services with respect to TCP and UDP protocols.
5. Explore the working of different application layer protocols and services.

Module – I

Preamble:

This course provides an outline of network functions by introducing data communication and network concepts such as characteristics, functions, benefits, metrics, and attributes that describe network features and performance. In broad sense, Computer Networks are bringing fundamental transformation in our society from an industry economy to an information economy. Data Communications and Networking is an integral part of contemporary technologies and hence gained significance in engineering education. With constants upgrade in knowledge and skills Computer networking can lead to an exciting and rewarding career including the potential job opportunities such as Network Specialists, Network Technicians, Network administrators, Network analysts and Network solution Architects.

Data Communications: Data Communications Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, **Physical Layer**: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), Analog to digital conversion (only PCM), Analog Transmission: Digital to analog conversion, Switching: Introduction, Circuit Switched Networks and Packet switching.

(8 Hours)

Module – II

Data Link Layer: Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Forward error correction, Data link control: DLC services, Data link layer protocols, Stop and Wait**,** Go-Back-N, Selective repeat, Point to Point protocol (Framing, Transition phases only). **Media Access control:** Random Access, Controlled Access and Channelization, Ethernet: IEEE 802.3 (8Hours)

Module – III

Network layer : IPV4 Addresses, Internet Protocols :IPv4 and IPv6, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm, Hierarchical Routing, Routing in the Internet, Intra-AS Routing in the Internet: RIP, Intra-AS Routing in the Internet: OSPF, Inter/AS Routing: BGP.

(8 Hours)

Module – IV

Transport Layer: Introduction to Transport layer services, Connectionless Transport: UDP, UDP Segment Structure, UDP Checksum, Connection-Oriented Transport TCP: TCP Segment Structure, Round- Trip Time Estimation and Timeout, TCP Connection Management, Principles of Congestion Control: The Causes and the Costs of Congestion, Approaches to Congestion Control, Network-assisted congestion-control example, ATM ABR Congestion control.

(8 Hours)

Module – V

Application Layer: Principles of Network Applications: Network Application Architectures, Processes Communicating, Transport Services Available to Applications, Transport Services Provided by the Internet, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Peer-to-Peer Applications: P2P File Distribution.

Recap/Summary of the Course

(8 Hours)

Course Outcomes:

The students will be able to:

CO1 Explain the fundamentals of data communication and apply the techniques to solve the given problem of frequency, signals, capacity of the channel and compute the performance of networks based on the metrics specified. PO1/K3-3.

CO2 Explore Access control mechanisms and Examine the relationship between bandwidth utilization, reliability and error control using appropriate techniques.
PO2/K3-3.

CO3 Discuss the working of routers, Internet protocol and Analyze unicast broadcast and multicasts protocols and design the new algorithm for the given problem.

CO4 Analyze the various services offered by the transport layer and investigate the reliability, flow control and congestion control techniques for the given problems.

CO5 Identify the principles used in design of the application, discuss the application layer protocols and different techniques to improve the application performance and justify solution,/ architecture for the given case study /problems.

CO6 Investigate the given problem using the relevant modern tool and interpret the data , compose the report based on literature survey, results obtained and demonstrate integrity of the report with 90% uniqueness using suitable software. PO1, PO2, PO4, PO5 and PO8 /K4.

Textbooks:

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

2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth edition, Pearson,2017.

References:

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts and Key architectures, 2nd Edition Tata McGraw-Hill, 2004.

2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.

3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.

4. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Base Management Systems Laboratory (0:0:2) 1

(Effective from the academic year 2023 -2024)

Course Code	**21CSL58A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	24	Exam Hours	3 Hours

Course Objectives:

This course will enable the students to

1. Foundation of knowledge in database concepts, technology and practice to groom the students into well informed database application developers.
2. Strong practice in SQL programming through a variety of database problems.
3. Develop Database applications using front end tools and Database as backend.

Laboratory Exercise:

PART A

Exercise 1:

Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)

BOOK_AUTHORS (Book_id, Author_Name)

PUBLISHER (Name, Address, Phone)

BOOK_COPIES (Book_id, Programme_id, No_of_Copies)

BOOK_LENDING (Book_id, Programme_id, Card_No, Date_Out, Due_Date)
LIBRARY_PROGRAMME (Programme_id, Programme_Name, Address)

Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.

2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.

3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.

4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

5. Create a view of all books and its number of copies that are currently available in the Library.

Exercise 2:

Consider the following schema for Order Database:

SALESMAN(Salesman_id,Name, City, Commission)

CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id)

ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)

Write SQL queries to

1. Count the customers with grades above Bangalore's average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List the entire salesman and indicate those who have and do not have customers in their cities (UseUNIONoperation.)
4. Create a view that finds the salesman who has the customer with the highest order of a day.
5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted

Exercise 3:

Consider the schema for Movie Database:

ACTOR(Act_id, Act_Name, Act_Gender)

DIRECTOR(Dir_id, Dir_Name, Dir_Phone)

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

MOVIE_CAST(Act_id, Mov_id, Role)

RATING(Mov_id, Rev_Stars)

Write SQL queries to

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

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

3. List all actors who acted in a movie before 2000 and in a movie after 2015 (use JOIN operation).

4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

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

Exercise 4:

Consider the schema for College Database:

STUDENT(USN, SName, Address, Phone, Gender)

SEMSEC(SSID, Sem, Sec)

CLASS(USN, SSID)

COURSE(Subcode, Title, Sem, Credits)

IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to

1. List all the student details studying in fourth semester 'C' section.
2. Compute the total number of male and female students in each semester and in each section.
3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.
5. Categorize students based on the following criterion:

If FinalIA = 17 to 20 then CAT = 'Outstanding'

If FinalIA = 12 to 16 then CAT = 'Average'

If FinalIA< 12 then CAT = 'Weak'

Give these details only for 8th semester A, B, and C section students.

Exercise 5:

Consider the schema for Company Database:

EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo)

DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate)

DLOCATION(DNo,DLoc)

PROJECT(PNo, PName, PLocation, DNo)

WORKS_ON(SSN, PNo, Hours)

Write SQL queries to

1. Make a list of all project numbers for projects that involve an employee whose last name is 'Scott', either as a worker or as a manager of the department that controls the project.
2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.
3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

PART B: Mini Project

Note:
Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web-based application (Mobile apps on Android/IOS are not permitted.)

For any problem selected make sure that the application should have five or more tables. Indicative areas include: Health care.

Course Outcomes:

The students will be able to

CO1: Apply the Conceptual Design Model and Database Hierarchical Structure to construct the real world requirement.

CO2: Implement different working concepts of DBMS using SQL Queries.

CO3: Develop a Database application using any Modern tool and generate the reports for the same.

- Conduction of Practical Examination:
  1. All lab Exercises from part A are to be included for practical examination.
  2. Mini project has to be evaluated for 30 Marks.
  3. Report should be prepared in a standard format prescribed for project work.
  4. Students are allowed to pick one experiment from the lot.
  5. Strictly follow the instructions as printed on the cover page of answer script.
  6. Marks distribution: a) Part A: Procedure + Conduction + Viva: 5 + 10 +5 =20 Marks

b) Part B: Demonstration + Report + Viva voce = 15+10+05 = 30 Marks

Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

Textbooks:

1. Database systems Models, Languages, Design and Application Programming, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Operating Systems Laboratory (0:0:2) 1

(Effective from the academic year 2023 -2024)

Course Code	**21CSL58B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	3 Hours

Course Objectives:

This course will enable students to

1. Analyse the design aspects of operating system concepts through simulation.
2. Simulate and demonstrate the performance of algorithm's used to perform services in operating system.

Laboratory Exercises:

Part-A

1. Installation of any operating system (windows, cent OS etc).
2. Install any guest operating system like ubuntu using VMware.
3. Study on installation of Android OS in PC

Part B:

Implement using Java/Python programming Language

1. Write a program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.
   a) FCFS b) SJF c) Round Robin d) Priority
2. Write a program to simulate producer-consumer problem using semaphores.
3. Write a program to simulate the concept of Dining-Philosophers problem.
4. Write a C-program to implement the file allocation technique. (Linked, Indexed or Contiguous)
5. Write a program to simulate the following contiguous memory allocation techniques
   a) Worst-fit b) Best-fit c) First-fit
6. Write a program to simulate deadlock avoidance using banker's algorithm.
7. Write a program to simulate deadlock detection using safety algorithm.
8. Write a program to simulate page replacement algorithms
   a) FIFO b) LRU c) LFU
9. Write a program to simulate paging technique of memory management.
10. Write a program to simulate the following Disk Scheduling Algorithms
    a) FCFS b) SCAN c) C-SCAN

Course Outcomes:

The students will be able to

CO1: Apply the scheduling algorithms for the given problem.

CO2: Analyse the performance of processes with and without process synchronization techniques.

CO3: Design resource allocation algorithms to detect and avoid deadlock.

CO4: Use different memory management techniques to allocate memory and analyse its performance.

CO5: Install various Operating systems with appropriate tools

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Communication and Network Laboratory (0:0:2) 1

(Effective from the academic year 2023-2024)

Course Code	**21CSL58C**	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	3 Hours

Course Objectives: This course will enable students to

1. Implement the techniques and protocols of data link, network, and transport and Application layers.

2. Simulate and demonstrate the performance of wired and wireless network using NS2/NS3.

Laboratory Exercises:

Part A: Implement using Java/Python programming Language

1. Implementation of Cyclic Redundancy Check for error correction and detection.
2. Implementation Of Address Resolution Protocol
3. Write a program for congestion control using leaky bucket algorithm.
4. Implement a Client Server program using TCP/IP.
5. Write a program to find the shortest path between vertices using bellman-ford algorithm
6. Write a program to implement FTP protocol.

Part B: Simulation using NS2/NS3

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.
2. Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents, changing the parameter and determine the number of packets sent by TCP / UDP.
3. Simulate an Ethernet LAN using n nodes (6-10), change error rate and data rate and compare throughput.
4. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
5. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
6. Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Part C: Group Assignments

1. Implement Bit stuffing and Character stuffing in data link layer framing.
2. Implementation of Hamming code algorithm
3. Implement a Datagram socket for client server application.
4. Write program to develop a DNS client server to resolve the given hostname.
5. Implementation of Go Back-N and selective repeat protocols.
6. Write a program to find the shortest path between vertices using dijkstra's algorithm.

Course Outcomes:

The students will be able to

CO1: Using NS2 design network topology as per the given problem and investigate the problem by analyzing the performance for the set of network parameters for different no of trails , tabulate the results, draw graphs to represent the observed values and arrive at valid conclusions**.**

CO2: Apply different techniques to ensure the reliable/ secured communication in wired / wireless communication, implement using java Programming language , verify the results and give valid conclusions**.**

CO3: write a report on each problem solved in laboratory and systematically communicate in writing the Lab records within the stipulated time period as per the defined procedure.

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Cryptography and Network Security (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	**21IS541**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03

This course will enable the students to:

1. Enable students to understand the basics of symmetric key and public key cryptography.
2. Equip students with some basic mathematical concepts and pseudorandom number generators required for cryptography.
3. Enable students to authenticate and protect the encrypted data.
4. Enhance their knowledge about Network and System security.

Module – 1

Introduction, Significance and scope of Cryptography, Cryptography in Economic growth of Nation, Impact of Cryptography on societal problems, sustainable solutions, Career perspective of Cryptography, current innovations in Cryptography, Cryptography in Research **Basic Concepts of Number Theory and Finite Fields**: Divisibility and the divisibility algorithm, Euclidean algorithm, Modular arithmetic, Prime Numbers, Fermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete logarithm.

(8 Hours)

Module – 2

Symmetric Ciphers: An overview of Symmetric Key Cryptography, Classical Encryption Techniques, Symmetric Cipher Model, Block Cipher Design Principles, DES, International Data Encryption Algorithm (IDEA), RC5, Blowfish, AES, Differential and Linear Cryptanalysis, Advance Encryption Standard (AES), AES Cipher, Multiple Encryption and Triple DES.

(8 Hours)

Module – 3

Principles of Public-Key Cryptosystems: The RSA algorithm, Diffie - Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Hash Functions: Massage authentication code, Security of Hash Functions and MAACs, Secure Hash algorithm, Whirlpool, HMAC, CMAC, Digital Signature. (8 Hours)

Module – 4

Network Security: Kerberos, X.509 Authentication Service, S/MIME, IP Security Architecture, Encapsulating Security Payload, Secure Socket Layer (SSL), Transport layer security, Secure Electronic Transaction.

(8 Hours)

Module – 5

System Security: Intrusion detection, Password Management, Virus countermeasure, Denial of Service Attack, Firewall design principles,

Recap/Summary of the course (8 Hours)

Course Outcomes: The students will be able to:

CO1: Use basic cryptographic algorithms to encrypt the data.
CO2: Generate some pseudorandom numbers required for cryptographic applications.
CO3: Provide authentication and protection for encrypted data.
CO4: Apply the hash function for the real time application.

Textbooks:

1. William Stallings,"CRYPTOGRAPHY AND NETWORK SECURITY PRINCIPLES AND PRACTICE" ,5th EDITION
2. Behrouz A. Forouzan," Cryptography and Network Security", TMH, 2007, First reprint 2010 ISBN-13: 978-0-07-070208-0

References:

1. Adam J.Elbirt" Understanding and Applying Cryptography and data security " CRC press, 2009, ISBN:978-1-4200-6161
2. Atul Kahate" Cryptography and Network Security" TMH, 2003, Eighth reprint 2006 isbn 0-07-049483-5

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Data Science (3:0.0) 3

(Effective from the academic year 2023-24)

Course Code:	**21IS542**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	100
Total Number of Contact Hours	3	Exam Hours	3

Course Objectives:

1. Provide a strong foundation for data science and application areas related to it.
2. Learn the process of working with data on large scale.
3. Explore the concepts of Data Processing.
4. Learn basic concepts of Machine Learning.
5. Prepare students for advanced courses in Data Science

Module – 1

Introduction to Data Science: Importance of data Science-Need for Data Science, What is Data Science? Data Science Process, prerequisites for data science, Components of Data Science, Tools and Skills needed.

Statistics: Data Types, Variable Types, Statistics, Sampling Techniques, Information gain and Entropy.

(08 Hours)

Module – 2

Probability: Probability Theory, Probability types, Probability Distribution Functions, Bayes Theorem.

Data Modeling and Analytics: Data Science Methodology-Analytics for data science, Example of Data Analytics, Data Analytics Life Cycle-Data Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalization. (08 Hours)

Module – 3

Machine learning –Designing a Learning System, Perspective and Issues in Machine Learning, Supervised learning, Unsupervised learning, Semi- supervised learning, Reinforcement Learning, Role of Machine Learning in Data Science, Data Science vs Machine Learning.

(08 Hours)

Module – 4

Databases for Data Science – SQL-for Data Science, Basic Statistics with SQL, Data Wrangling, Filtering, Joins, Aggregation, Advanced No SQL for Data Science, Document Databases for Data science, Wide Column Databases for Data science, Graph Databases for Data Science.

(08 Hours)

Module – 5

Data Analytics and Text Mining: What is Text Mining?, Process of Text Mining, Difference between Text Mining and Data Mining, Major Text Mining Areas, Text Analytics, Text Analytics Steps, Basic Text Analytics Steps.

Introduction to NLP: Introduction, Major Components of NLP, Stages of NLP, Statistical Processing of NLP, Applications of NLP. (08 Hours)

Course Outcomes: The students will be able to:

CO1: Understand the fundamental concepts of data science

CO2: Evaluate the data analysis techniques for applications handling large data and Demonstrate the data science process.

CO3: Understand concept of machine learning used in the data science process.

CO4: Visualize and present the inference using various tools.

CO5: Learn to think through the ethics surrounding privacy, data sharing.

Textbooks:

1. Fundamentals of Data Science**,** Sanjeev J. Wagh, Manisha S. Bhende, and Anuradha D. Thakare, Firstedition published 2022 by CRC Press.
2. Machine Learning, Tom Mitchell, McGraw Hill, 1997.

References:

1. Python for data science for dummies 2nd Edition, John Paul Mueller, Luca Massaron, Wiley
2. Programming through Python, M. T. Savaliya, R. K. Maurya, G. M. Magar, STAREDU Solutions
3. Pandas for everyone :Python Data Analysis, Daniel Y. Chen, Pearson
4. Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools, Davy Cielen, Arno D.B. Meysman, et al., Minning
5. Applied Data Science with Python and Jupyter: Use powerful industry-standard tools to unlock new, actionable insights from your data, , Packt
6. Data Analytics, Anil Maheshwari , McGrawHill
7. Data Science From Scratch: First Principles with Python, Joel Grus , SPD

B.E. INFORMATION SCIENCE & ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Systems for IoT (**3:0:0**) 3

(Effective from the academic year 2023-24)

Course Code	**21IS543**	CIE Marks	50
Teaching Hours/Week (L: T:P)	3-0--0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Pre-Requisite(s): Programming concepts and Computer Networks

Course Objectives:

This course will enable students to:

1. Internet-of-Things (IoT) plays a consequential role to improve almost all aspects of human life, i.e. domestic automation, transportation, education, health, agriculture, industry, etc.
2. The simple conception of IoT as a network of identifiable connected smart things is fundamentally based on the integration of various diversified technologies including pervasive computing, sensor technology, embedded system, communication technologies, sensor networking, Internet protocols, etc. for the provisioning of intelligent computing services.
3. To provide a basic, precise, and accurate demonstration of IoT building blocks as well as their role in various IoT systems.
4. At an abstract level, to understand an effort to partially fill the gap associated with the understanding of IoT concepts through the designing of the IoT system prototypes in Packet Tracer.

Module – 1

Internet of Things (IoT) Fundamentals 1.1.

Introduction, Evolution of IoT Concept, IoT Vision,IoT Definition,IoT Basic Characteristics,IoT Distinction,IoT General Enablers,IoT Architectures,Advantages and Disadvantages of IoT**,** IoT Building Blocks – Hardware and Software,IoT Building Blocks,The Smart Things,The IoT Gateway,Network Infrastructure, IoT Cloud, IoT Analytics,IoT Application

(8 Hours)

Module – 2

Sensing Principles and Wireless Sensor Network :

Sensor Fundamentals, Sensor Classification, Anatomy of Sensors, Physical Principles of Sensing, Use of Basic Sensing Principles in RFID Technology, Actuators, Wireless Sensor Networks (WSNs),IoT Gateway,The IoT Gateway, Sensing Domain and IoT Gateways, The Architecture of IoT Gateway, Selection of IoT Gateway, IoT Gateways and Edge Computing, IoT Gateway Providers

(8 Hours)

Module – 3

IoT Protocol Stack :

IoT Protocol Stack, IoT Protocols, IoT Cloud and Fog Computing, IoT Cloud,Fog Computing for IoT, Case Study – Vehicles with Fog Computing, IoT Applications, Application Domains of IoT, IoT and Smart Home, IoT and Healthcare, IoT and Smart Mobility, IoT and Agriculture, Smart Grid, IoT-based Smart Cities, IoT and Smart Education, Industrial IoT

(8 Hours)

Module – 4

IoT Security :

IoT Systems and Security Constraints, IoT Security Requirements, Security Challenges, Taxonomy of IoT Security Threats/Attacks, IoT Architecture and IoT Security, Multilayer Security Attacks, IoT Application Scenarios and IoT Security, Social IoT ,Smart Things to Social Things, The Epitome of SIoT, Smart Thing Relationships in SIoT, SIoT Architecture, Features of SIoT System, Social Internet of Vehicles (SIoV) – An Example Use Case of SIoT, SIoV Application Services

(8 Hours)

Module – 5

Packet Tracer and IoT ,IoT and Packet Tracer, Packet Tracer Programming Environment, Visual (Blockly) Programming Language, Simple Smart Light Project, IoT Projects in Packet Tracer 235, IoT Projects in Packet Tracer 235,Smart Things Directly Connected with Gateways Smart Things and Sensors Directly Connected with MCUs (Without Gateways)

(8 Hours)

Course Outcomes:

The students will be able to:

CO1: Understand the fundamentals of IoT and its real-time benefits.

CO2: Understand the foundations of modeling in IoTs, and sensor networks and apply them in real-time use.

CO3: Understand the design and building blocks of IoTs, Protocols & Security issues

CO4: Understand the techniques of packet tracer and application in real-time use.

Text Book(s)

1. Enabling the Internet of Things - Fundamentals, Design, and Applications.
By Muhammad Azhar Iqbal, Sajjad Hussain, Huanlai Xing, Muhammad Ali Imran
2020,Publisher: Wiley

Reference(s)

1. Raj Kamal, “Internet of Things: Architecture and Design Principles”,First Edition, McGraw Hill Education, 2017.
2. Peter Waher, “Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3”, First Edition, Packt Publishing, 2018.

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS**)**

SEMESTER - V

Human Computer Interaction (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	**21IS544**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hours

Course Objectives:

To learn the foundations of Human Computer Interaction.

- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

Module – I

FOUNDATIONS OF HCI:

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

(8Hours)

Module – II

DESIGN & SOFTWARE PROCESS:

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design. (8Hours)

Module – III

MODELS AND THEORIES:

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW. (8Hours)

Module – IV

MOBILE HCI:

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies (8Hours)

Module – V

WEB INTERFACE DESIGN:

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies (8Hours)

Course outcomes:

Upon completion of the course, the students should be able to:

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

- **Question paper pattern: SEE** will be conducted for 100 marks.

  Part A: First question with 20 MCQs carrying 1 mark each.

  Part B: Each full question is for 16 marks. (Answer five full questions out of 10 questions with intra modular choice). In every question, there will be a maximum of three sub-questions.

CIE will be announced prior to the commencement of the course

25 marks for test. Average of three test will be taken.

25 marks for Alternate Assessment Method

Textbooks:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction||, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)

2. Brian Fling, —Mobile Design and Development||, First Edition, O'Reilly Media Inc., 2009 (UNIT – IV)

B.E INFORMATION SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – V

Computer Graphics and Visualization (3:0:0) 3

(Effective from the academic year 2023-24)

Course Code	**21IS545**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

1. Explain hardware, software and OpenGL Graphics Primitives.
2. Illustrate interactive computer graphic using the OpenGL.
3. Design and implementation of algorithms for 2D graphics Primitives and attributes.
4. Demonstrate Geometric transformations, viewing on both 2D and 3D objects.
5. Infer the representation of curves, surfaces, Color and Illumination models

Module – 1

Overview: Computer Graphics and OpenGL: Computer Graphics: Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, graphics software. OpenGL: Introduction to OpenGL ,coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL point attribute functions, OpenGL line attribute functions, Line drawing algorithms(DDA, Bresenham‟s), circle generation algorithms (Bresenham‟s). Text-1:Chapter -1: 1-1 to 1-9, 2-1(page 39 to 41),2.8,2.9,3-1 to 3-5,3-9,3-20 RBT: L1, L2, L3

Module – 2

Fill area Primitives, 2D Geometric Transformations and 2D viewing: Fill area Primitives: Polygon fill-areas, OpenGL polygon fill area functions, fill area attributes, general scan line polygon fill algorithm, OpenGL fill-area attribute functions. 2DGeometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 2D viewing: 2D viewing pipeline, OpenGL 2D viewing functions. Text-1:Chapter 3-14 to 3-16,4-9,4-10,4-14,5-1 to 5-7,5-17,6-1,6-4

Module – 3

Clipping,3D Geometric Transformations, Color and Illumination Models: Clipping: clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine transformations, OpenGL geometric transformations functions. Color Models: Properties of light, color models, RGB and CMY color models. Illumination

Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model, Corresponding openGL functions.

Module – 4

3D Viewing and Visible Surface Detection: 3DViewing:3D viewing concepts, 3D viewing 10 pipeline, 3D viewing coordinate parameters , Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. OpenGL 3D viewing functions. Visible Surface Detection Methods: Classification of visible surface Detection algorithms, depth buffer method only and OpenGL visibility detection functions.

Module – 5

Input& interaction, Curves and Computer Animation: Input and Interaction: Input devices, clients and servers, Display Lists, Display Lists and Modeling, Programming Event Driven Input, Menus Picking, Building Interactive Models, Animating Interactive programs, Design of Interactive programs, Logic operations .Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions. Corresponding openGL functions

Course Outcomes: The students will be able to:

CO1: Design and implement algorithms for 2D graphics primitives and attributes

CO2: Illustrate Geometric transformations on both 2D and 3D objects.

CO3: Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.

CO4: Analyze suitable hardware and software for developing graphics packages using OpenGL.

Textbooks:

1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd / 4th Edition, Pearson Education,2011

2. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008

References:

1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education Graphics, concepts and applications, Cengage Learning

2. M M Raikar & Shreedhara K S Computer Graphics using OpenGL, Cengage publication