IV SEM

(2018-19)

Discrete Mathematical Structures and Graph Theory

(Computer Science / Information Science)

Subject Code:	18MATCS41	**Credits:**	04
Course Type:	BS	**CIE Marks:**	50
Hours/week: L – T – P	4 –0– 0	**SEE Marks:**	50
Total Hours:	40	**SEE Duration:**	3 Hours

Course Learning Objectives (CLOs):

Students should

1. Understand and apply Logic in the field of Computer science.
2. Understand the various Relations and Functions.
3. Understand advanced counting techniques.
4. Get acquainted with basic concepts of Graph Theory and their applications.
5. Get acquainted with elementary Number theory, and their properties for applications in Cryptography.

Prerequisites:

1. Set Theory
2. Power series
3. Binomial Series
4. Basics of Counting

Detailed Syllabus

Unit-I

08 hrs

Fundamentals of Logic: Laws of Logic, Logical Implication-Rules of Inference, Quantifiers- Universal and Existential Quantifiers, Proofs Techniques: direct, indirect and Contradiction.

Unit–II

08 hrs

Relations and Functions: Zero-One Matrices and Directed Graphs, Closure and Equivalence Relations and Partitions, Partial Orders, Hasse Diagrams, Lattice, Properties of functions, Composition and Invertible functions.

Unit-III

08 hrs

Advanced Counting Techniques: Sterling Number of second kind, Inclusion and Exclusion, Pigeonhole Principle, Generating Function, Recurrence relations, Solution of Linear homogeneous and non-homogeneous recurrence relations with constant coefficients, Divide and Conquer Algorithms, Merge sort algorithm.

Unit-IV

08 hrs

Basic Graph Theory: Definitions and Examples, Subgraphs, Complements and Graph Isomorphism, Connectivity, Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles, Coloring, Matching.

Unit-V 08 hrs

Elementary Number Theory and Cryptography: Fields, Modular Arithmetic, Prime Numbers, Fermat's and Euler's theorem. Testing of Primality, Chinese Remainder Theorem. Caesar Encryption/Decryption, RSA Cryptosystem.

Text Books:

1. Kolman, Busby, Ross "Discrete Mathematical Structures", 6th Edition Prentice Hall of India, 2010 onwards.
2. William Stallings "Cryptography and Network Security", Pearson Prentice Hall 6th Edition, 2013 onwards.
3. Kenneth H. Rosen "Discrete Mathematics and its applications", Mc Graw Hill 7th Edition.

Reference Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004 onwards.
2. K. D Joshi, "Foundations of Discrete Mathematics", 2nd Edition, New Age International Publishers, 2014 onwards.

Course Outcomes (COs): At the end of the course students will be able to:

1. **Understand** and **Apply** the Logic of Mathematics in the field of Computer science. **[L2, L3]**
2. **Explain and Analyze** Different Relations and Functions. **[L2, L3]**
3. **Discuss** basic concepts of Graph Theory and its **Use** in Computer Science. **[L2, L3]**
4. **Explain** the concept of Finite Fields. **[L2]**
5. **Apply** Finite Fields to Cryptography. **[L3]**

Program Outcomes (POs) of the course: Students will acquire

1. An ability to apply knowledge of Mathematics, science and Engineering. **[PO1]**
2. An ability to identify, formulate and solve engineering problems. **[PO5]**
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice. **[PO11]**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments /matlab/Scilab activity	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Operating System (Theory)

Course Code	18CS42/18IS42	**Credits**	04
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	4 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 47 Hrs; Tutorial = 00 Hrs Total = 47 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To introduce the functions of operating system, design, structure and associated system calls.
2. To study and analyze various scheduling algorithms and process synchronization techniques.
3. To develop an understanding about deadlocks and deadlock recovery techniques.
4. To discuss and realize the importance of memory management techniques.
5. To gain the knowlecge of file systems and secondary storage structures.

Pre-requisites: Basic knowledge of computer concepts & programming, Computer Organization.

Unit – I — 10 Hours

Introduction to Operating System: System structures: What operating systems do; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Operating System Services; System calls; Types of system calls; Operating System structure; System boot.

Introduction to UNIX File System: Inside UNIX, Internal and External Commands, Command structure.

Case Study: Android Operating System / iOS

Unit – II — 09 Hours

Process Management: Process concept; Process scheduling; Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms.

The Process: Understanding the process, How a process is created, the login shell, init, internal and external commands, ps.

Unit – III

09 Hours

Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization.

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

Unit – IV

09 Hours

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement;

Unit – V

10 Hours

File System: Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure.

The File System: The parent child relationship, The UNIX file system, Absolute Pathnames, Relative Pathnames, pwd, cd, mkdir, rmdir, cp, rm, mv, cat. **File Attributes:** ls, ls-l, ls-d, file permissions, chmod.

Books

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", Wiley India, 6th edition and onwards.
2. Sumitabha Das: "YOUR UNIX – The Ultimate Guide" , Tata McGraw Hill, 23rd reprint, 2012 and onwards.

Reference Books:

1. Gary Nutt, "Operating System", Pearson Education, 2nd edition and above.
2. Harvey M Deital, "Operating system", Addison Wesley, 2nd edition and above.
3. D.M Dhamdhere, "Operating System", "A concept based Approach", Tata McGraw- Hill, 2nd edition and onwards.
4. Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell Programming ", Cengage Learning, 2005 and onwards.

E-resourses (NPTEL/SWAYAM)

1. **https://onlinecourses.nptel.ac.in/**

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	**Explain** the computer system resources and the role of an operating system in managing those resources.	L2
2.	**Develop** applications keeping concurrency and synchronization, semaphores, Monitors, sharedmemory, **mutual** exclusion, process scheduling services of general operating system in the mind.	L3
3.	**Describe and analyze memory** management, file management and secondary Memory Management techniques.	L3
4.	**Discuss** UNIX shell commands for file handling , process control and do the case study on on Android Operating System / iOS.	L2

Program Outcome of this course (POs)		PO No.
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	PO1
2.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / Edusat	4. Course Seminar
5. Class Room Exercises	5. Course Project (Mini project)
	6. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory.				
Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Database Management System (Theory)

Course Code	18CS43/18IS43	Credits	04
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	4 – 0 – 0	SEE Marks	50 marks
Total Hours:	Lecture = 48 Hrs; Tutorial = 00 Hrs Total = 50 Hrs	SEE Duration	3 Hours for 100 marks

Course learning objectives

1. To discuss and realize the importance of Database Architecture Design notations, ER Modeling, Mapping and Schema design.
2. To gain the knowledge Relational algebra and learn the use of SQL and PL/SQL.
3. To introduce formal database design approach through normalization and discuss various normal forms.
4. To understand the importance of Concurrent Transactions and discuss issues and transaction control algorithms.

Pre-requisites :

- Basic programming concepts.

Unit – I

9 Hours

Introduction: Introduction to database, Characteristics of Database approach, Advantages of using DBMS approach, Three-schema architecture and data independence.

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship types, Roles and Structural Constraints; Weak Entity Types.

CASE STUDY: ER-Modeling of Airline Reservation System, Hospital Management and Educational Institute.

Unit – II

9 Hours

Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Dealing with constraint

violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations.

Unit – III **9 Hours**

Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.

Transaction Processing Concepts: Introduction to Transaction processing, Transaction and System concepts, Desirable properties of Transactions and issues with concurrent transactions.

SELF STUDY: Triggers **1 Hour**

Unit – IV **9 Hours**

SQL :SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL.

Unit – V **9 Hours**

PL/SQL :PL/SQL Block Structure, PL/SQL Variables, PL/SQL Function , PL/SQL Procedure, PL/SQL IF Statement , PL/SQL Loop Statement: PL/SQL WHILE Loop Statement, PL/SQL FOR Loop Statement.

SELF STUDY: PLSQL installation and Programming. **2 Hours**

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 3rd edition and onwards.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill, 2nd edition and onwards.

Reference Books::

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, Mc-GrawHill, 3rd edition and onwards.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, Pearson education, 5th edition and onwards.

E Resources:

3. PL/SQL study material.

Course Outcome (Cos)

At the end of the course, the student will be able to	Bloom's Level
1. **Apply** the database concepts and design database for given application scenerio.	L3
2. **Apply** the concepts of Normalization and design database which eliminates all anomalies.	L3
3. **Create** database and develop database programming skills in SQL and PL/SQL.	L4
4. **Explain** the issue of concurrency control in transaction processing.	L2

Program Outcome of this course (POs)	PO No.
1. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
2. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
3. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
4. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
5. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

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Course type	PC	CIE Marks	50 marks
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The Process: Understanding the process, How a process is created, the login shell, init, internal and external commands, ps.

Unit – III

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Unit – V

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The File System: The parent child relationship, The UNIX file system, Absolute Pathnames, Relative Pathnames, pwd, cd, mkdir, rmdir, cp, rm, mv, cat. **File Attributes:** ls, ls-l, ls-d, file permissions, chmod.

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4. **Discuss** UNIX shell commands for file handling , process control and do the case study on on Android Operating System / iOS.	**L2**

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Database Management System (Theory)

Course Code	18CS43/18IS43	Credits	04
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	4 – 0 – 0	SEE Marks	50 marks
Total Hours:	Lecture = 48 Hrs; Tutorial = 00 Hrs Total = 50 Hrs	SEE Duration	3 Hours for 100 marks

Course learning objectives

1. To discuss and realize the importance of Database Architecture Design notations, ER Modeling, Mapping and Schema design.
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CASE STUDY: ER-Modeling of Airline Reservation System, Hospital Management and Educational Institute.

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9 Hours

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Unit – III

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SELF STUDY: Triggers 1 Hour

Unit – IV

9 Hours

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Unit – V

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E Resources:

3. PL/SQL study material.

Course Outcome (Cos)

At the end of the course, the student will be able to	Bloom's Level
1. Apply the database concepts and design database for given application scenario.	L3
2. Apply the concepts of Normalization and design database which eliminates all anomalies.	L3
3. Create database and develop database programming skills in SQL and PL SQL	L4
4. Explain the issue of concurrency control in transaction processing.	L2

Program Outcome of this course (POs)	PO No.
1. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
2. **Design development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
3. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4
4. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	PO10
5. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Course delivery methods

1. Lecture & Board
2. Power-point Presentation
3. Online Videos / Learning
4. NPTEL / Edusat
5. Class Room Exercises

Assessment methods

1. Assignments
2. Quizzes
3. Internal Assessment Tests
4. Course Project (Mini project)
5. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

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Minimum marks required to qualify for SEE : 20 out of 50 marks				

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1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
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Design and Analysis of Algorithm(Theory)

Course Code	18CS44/18IS44	Credits	03
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	3 – 0 – 0	SEE Marks	50 marks
Total Hours:	Lecture = 40 Hrs; Tutorial = 00 Hrs Total = 40 Hrs	SEE Duration	3 Hours for 100 marks

Course learning objectives

1. To bring out the importance of the study of algorithms.
2. To study and analyze time complexity of various algorithms.
3. To discuss various algorithm design techniques.
4. To develop a technique of analyzing and computing the performance of algorithms.
5. To discuss various string matching algorithms.

Pre-requisites: Basic Computer Programming

Unit – I

8 Hours

Introduction: Fundamentals of Algorithmic Problem Solving, Analysis Framework, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Brute Force Approaches: Introduction, Selection Sort, linear search.

Self learning topics: Short Tutorial on Recurrence Relations, Bubble Sort(1Hr)

Unit – II

8 Hours

Algorithm Design Technique-I: Divide and Conquer, Decrease-and-Conquer Transform and Conquer, the General approach and illustration.

Applications of Divide and Conquer technique: Binary Search, Merge Sort, Quick Sort and their performance comparison. Counting Leaf-nodes, Tiling-Game Implementation.

Applications of Decrease and Conquer technique: Insertion Sort, Depth First Search and Breadth First Search. Maze-Game implementation.

Applications of Transform and Conquer: Heaps and Heap Sort, Horner's Rule. Clustering.

Self learning topics: Multiplication of Large Integers and Binary Exponentiation. (2 Hrs)

Unit – III

Algorithm Design Technique-II: The General Greedy Technique, Illustration with examples. 8 Hours

Applications of Greedy method: Kruskal's Algorithm – Minimum-Cost Spanning Trees: Prim's Algorithm, Single Source Shortest Path - Dijkstra's Algorithm, Huffman Trees – Encoding of Data.

Unit – IV

Algorithm Design Technique-III: Dynamic Programming Definition and Concept 8 Hours Illustration. The General Method,

Applications of Dynamic programming: Warshall's Algorithm – Transitive Closure, Floyd's Algorithm for the All-Pairs Shortest Paths, Knapsack using General Weights and 0/1 Knapsack. Longest Common Difference – Used in implementation of Diff command and polynomial interpolation.

Self learning topics: Computing nCr, the dynamic approach (1 Hr)

Unit – V

8Hours

Algorithm Design Technique-IV: Backtracking, Branch-and-Bound, String Matching, basics and illustrations.

Applications of backtracking: N - Queens's problem, Hamiltonian Circuit Problem, Sum of Subset – Problem and its use in public key cryptosystem. Graph coloring problem.

Applications of branch and bound: JobAssignment Problem, Knapsack Problem, Traveling Salesperson Problem. Best First Search used in AI.

Applications string matching: Input Enhancement in String Matching, Horsepool's method. Rabin-Karp Algorithm. Used in Text processing toolkits like nltk.

Self learning topics: Naïve String Matching Algorithm. (1Hr)

Text Books:

1. Anany Levitin, Introduction to The Design & Analysis of Algorithms, Pearson Education 1st edition and onwards.
2. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Fundamentals of Computer Algorithms Universities Press, 1st edition and onwards.

Reference Books:

1. Kenneth Berman, Jerome Paul, Algorithms, Cengage Learning.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, introduction to Algorithms PHI, 2nd edition and above.
3. R.C.T. Lee, S.S. Tseng, R.C. Chang &Y.T.Tsai: Introduction to the Design and analysis of Algorithms A Strategic Approach, TataMcGraw Hill.
4. NarasimhaKarumanchi, Data structures and Algorithms Made Easy, Career Monk Publications, 1st edition and above.

E Resources:

https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Formulate and Solve** recurrence equation and compute time complexity of recursive and iterative algorithms	L3
2. **Explain** divide ,decrease ,transform and conquer strategy as applied to sorting and analyze the algorithm complexity	L2
3. **Apply** Dynamic Programming, Greedy approach, to solve a variety of problems.	L3
4. **Design and analyze** String search algorithms and Compare their time complexities.	L4
5. **Apply** branch and bound and backtracking approaches to solve a variety of practical problems	L3

Program Outcome of this course (POs)	PO No.
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	PO1
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
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Software Engineering (Theory)

Course Code	18CS45/18IS45	Credits	03
Course type	PC	CIE Marks	50 marks
Hours/week: L-T-P	3 – 0 – 0	SEE Marks	50 marks
Total Hours:	40	SEE Duration	3 Hours for 100 marks

Course learning objectives

1. **Recall** the professional & ethical responsibilities and process models of Software Engineering.
2. **Prepare** Test cards and Project schedule models for the given scenarios.
3. **Identify** the requirements and the cost for the development of Software.
4. **Compare** the various software testing processes

Pre-requisites :Knowledge of Basic Programming Language.

Unit – I

8 Hours

Introduction: Professional Software Development: Software Engineering, Software Engineering Ethics. A Case Study.

Software Process: Software Process models: The Waterfall model – A Case study, Incremental development, Reuse- oriented software engineering, Process activities: Software specification, Software design and implementation, Software validation, Coping with Change: Prototyping, Incremental Delivery, Boehm's Spiral Model.

Unit – II

8 Hours

Requirements Engineering: Functional and non-functional requirements: Functional requirements, non-functional requirements, Case studies, The Software requirements document, Introduction to Requirements specification, Requirements Engineering processes: Requirement Elicitation and Analysis.

Unit – III

8 Hours

Design Engineering: Context Models, Interaction Models, Design within the Context of Software Engineering ,Design Process and Design Quality, Design Concepts: Abstraction , Architecture, Patterns, Modularity , Information Hiding, Functional Independence, Refinement, Refactoring

Agile Software Development: Agile methods, Plan driven and Agile Development, Introduction to Extreme Programming. Self Study: SCRUM

Unit – IV

Project Planning: Software pricing, Plan-driven Development: Project Plans, Planning process, Project scheduling: Schedule Representation, Agile Planning, Estimation techniques: Algorithmic Cost Modeling. The COCOMO II Model. Project Duration and Staffing. **8 Hours**

Unit – V

Software Testing: Development Testing: Unit Testing, Choosing Unit Test Cases, Component Testing, System Testing, Test Driven Development, Release Testing, Requirements Based Testing, Scenario Testing, Performance Testing, User Testing. A Demo of Selenium. **8 Hours**

Books

Text Books:

1. Ian Sommerville: Software Engineering, Pearson Education, 9th Edition onwards. **Chapter 1: 1.1, 1.2, 1.3 , Chapter 2: 2.1, 2.2, 2.3, Chapter 3: 3.1, 3.2, 3.3 Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.5, Chapter 5: 5.1, 5.2 , Chapter 8: 8.1, 8,2, 8.3, 8.4 Chapter 23: 23.1, 23.2, 23.3, 23.4, 23.5**
2. Rajib Mall, Fundamentals of Software Engineering , 4th Edition onwards PHI Learning Private Ltd.

Reference Books:

1. Roger .S. Pressman: Software Engineering-A Practitioners approach, 6th Edition and above, Tata McGraw Hill, 2007 onwards. **(Chapter 9th : 9.1 to 9.3)**
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009 onwards.

E Resources:

https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

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

		Bloom's Level
1.	**Recall** the professional & ethical responsibilities and process models of Software Engineering.	L1,L2
2.	**Prepare** Test cards and Project schedule models for the given scenarios.	L3
3.	**Identify** the requirements and the cost for the development of Software.	L2
4	**Compare** the various software testing processes	L4

Program Outcome of this course (POs)

		PO No.
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1
2.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3
3.	**Ethics:** Apply ethical principles and commit to professional ethics and	8

responsibilities and norms of the engineering practice.

4.	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	9
5.	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	11
6.	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	12

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Python Programming (Integrated Lab)

Course Code	18CSL46/18ISL46	Credits	03
Course type	PC	CIE Marks	25 marks
Hours/week: L-T-P	2 – 0 – 2	SEE Marks	25 marks
Total Hours:	Lecture = 20 Hrs; Lab= 30 Hrs Total = 50 Hrs	SEE Duration	3 Hours for 50 marks

Course learning objectives

1. Gain knowledge about basic Python language syntax and semantics to write Python programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Python, including defining classes, objects, invoking methods,exception handling mechanisms.
3. Understand the principles of inheritance, packages and interfaces.
4. Demonstrate the NumPy and SciPy package for scientific computing and data manipulation.

Pre-requisites : Basics of Object Oriented Programming using C++/Java

Unit - I

8 Hours

Introduction to Python, use IDLE to develop programs, Basic coding skills, working with data types and variables, working with numeric data, working with string data, Python functions, Boolean expressions, selection structure, iteration structure, Illustrative Programs

Unit - II

8 Hours

Define and use functions and modules, Basic skills for working with lists, work with a list of lists, work with tuples, get started with dictionaries, An introduction to file I/O, use text files, use CSV files, Handle a single exception, handle multiple exceptions Illustrative programs

Unit - III

8 Hours

Object Oriented Programming, An introduction to classes and objects, define a class, work with object composition, work with encapsulation, work with inheritance, override object methods, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event Illustrative programs

Unit - IV

8 Hours

NumPy Basics: Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes.

Unit - V

8 Hours

SciPy:Optimization and Minimization, Interpolation, Integration, Statistics

Books

Text Books:

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012
3. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

Reference Books:

1. SciPy and NumPy, O`Reilly, 1st Edition, 2012

E-resourses

1. NumPy Reference Manual

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Explain** basic principles of Python programming language	L2
2. **Implement** object oriented concepts, database and GUI applications.	L3
3. **Implement** basic programs using Numpy and Panda packages	L3

Program Outcome of this course (POs)	PO No.
1. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
2. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	PO5
3. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	PO12

Course delivery methods	Assessment methods
1. Chalk and board	1. Project
2. PPT	2. Experiments
3. Video lectures	

List of Experiments (Part A)

1. Develop and execute an Object Oriented program in Python using basic data structures like arrays and dictionaries.

2. Develop and execute an Object Oriented program in Python to demonstrate inheritance and polymorphism.
3. Develop and execute an Object Oriented program in Python to demonstrate database connectivity.
4. Develop and execute an Object Oriented program in Python using file I/O and exception handling.
5. Develop a program in Python to demonstrate the use of NumPy package.
6. Develop a program in Python to demonstrate the use of SciPy package.

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codesrelated to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Algorithms Laboratory

Course Code	18CSL47/18ISL47	Credits	1.5
Course type	LAB	CIE Marks	25 marks
Hours/week: L-T-P	0 – 0 – 3	SEE Marks	25 marks
Total Hours:	36	SEE Duration	3 Hours for 50 marks

Course learning objectives

1. Illustrate the importance of algorithms in a variety of applications.
2. Illustrate the use of recursive/iterative sorting algorithms in different scenarios.
3. Demonstrate time complexity of various algorithms using various design techniques.
4. Demonstrate efficient algorithms by drawing comparisons.
5. Illustrate the use of algorithms for graph search problems.

Pre-requisites :

- Basic computer science concepts such as procedures, decision statements, and loops.
- Basic data structures such as lists, dictionaries, and hash tables.

List of experiments(Programming language C / Java)

1. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
2. Implement Quick Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
3. Implement Insertion Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
4. Implement Heap Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra s algorithm.

6. Find the Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

7. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

8. Implement 0/1 Knapsack problem using Dynamic Programming.

9. Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S={1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.

10. Implement N Queen's problem using Back Tracking.

Text Books:

1. Anany Levitin, Introduction to The Design & Analysis of Algorithms, Pearson Education, 1st edition and onwards.

2. Java, The Complete Reference, Herbert Schildt.

Reference Books::

1. Kenneth Berman, Jerome Paul, Algorithms, Cengage Learning.

2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, introduction to Algorithms PHI, 2nd edition and onwards.

E Resources:

https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Identify** and implement an appropriate algorithm design technique for a given problem.	L1
2. **Implement** and **Compute** time required for recursive and iterative algorithms.	L3
3. **Design** algorithms for specific applications using appropriate techniques.	L6
4. **Design** graph search and sorting algorithms.	L6

Program Outcome of this course (POs)	PO No.
1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	PO1
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	PO4

Assessment methods

1. Regular Journal Evaluation & Attendance Monitoring.
2. Lab Internal Assessment.

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE				
Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up:Algorithm/Flowchart/Tracing	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		
5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Database Application Laboratory

Course Code	18CSL48/18ISL48	Credits	1.5
Course type	LAB	CIE Marks	25 marks
Hours/week: L-T-P	0 – 0 – 3	SEE Marks	25 marks
Total Hours:	36	SEE Duration	3 Hours for 50 marks

Course learning objectives

1. Gain a good understanding of the architecture and functioning of Database Management Systems as well as associated tools and techniques.
2. Understand and apply the principles of data modeling using Entity Relationship and develop a good database design
3. Apply Normalization techniques to normalize a database.
4. Understand the use of Structured Query Language (SQL) and its syntax.
5. Learn the tools required for graphical user interface design

LAB TERM WORKS:

PART – A

1. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
   - the NHL has many teams,
   - each team has a name, a city, a coach, a captain, and a set of players,
   - each player belongs to only one team,
   - each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
   - a team captain is also a player,
   - a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

   Design a ER-Model for this application scenario using all the standard notations of ER-Model. Apply the ER-to-Relational Rules and normalization to get the relational schema and do the following :

   a. Create the database with all necessary constraints(Primary and Foreign keys)
   b. Populate each table with appropriate data
   c. Execute queries on the tables created.(open ended)
   d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

2. Design an ER-Model for an educational institute which is required to record the students attendance and IA performance in all the subjects and inform the same to their parents. The institute will have many department, each with its own faculty and Head of the department. The

subjects the students study can be either elective or core. A faculty has to take atleast one subject and atmost 2 subjects and the subjects are not shared. The students take 3 tests and the average is computed by taking average of best two of the three scores. The model be designed to record only the CIE marks and not SEE marks. After the ER-Model, map it to relational schema by indentifying Primary and Foreign keys. Normalize and do the following.

a. Create the database with all necessary constraints(Primary and Foreign keys)
b. Populate each table with appropriate data
c. Execute queries on the tables created.(open ended)
d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

3. Consider the schema for airline flight information Database:

FLIGHTS (*no: integer, fromPlace: string, toPlace: string, distance: integer, Departs: date,arrives: date, price: real*)

AIRCRAFT (*aid: integer, aname: string, cruisingrange: integer*)

CERTIFIED (*eid: integer,aid: integer*)

EMPLOYEES (*eid: integer, ename: string, salary: integer*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.
2. For each pilot who is certified for more than three aircrafts, find the eid, ename and the maximum cruising range of the aircraft for which she or he is certified.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.
4. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi

4. Consider the following schema for Order Database:

SALESMAN (*Salesman_id, Name, City, Commission*)

CUSTOMER (*Customer_id, Cust_Name, City, Grade, Sclesman_id*)

ORDERS (*Ord_No, Purchase_Amt, Ord_Date, customer_id,Saleman_id)*

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

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 all salesmen names and customer names for whom order amount is more than 4000.
4. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

5. Consider the schema for Movie Database:

ACTOR (*Act_id, Act_Name, Act_Gender*)

DIRECTOR (*Dir_id, Dir_Name, Dir_Phone*)

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

MOVIE_CAST (*Act_id,Mov_id, Role*)

RATING (*Mov_id, Rev_Stars*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. List the titles of all movies directed by "Sanjay Leela Bansali" .
2. Find the movie names where one or more actors acted in two or more movies.
3. 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.
4. Update rating of all movies directed by "Ram GopalVerma" to 5.

PART – B

The students will design and implement a mini project on the lines of part A.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 3rd edition and onwards.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill, 2nd edition and onwards.

Reference Books::

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, Mc-GrawHill, 3rd edition and onwards.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, Pearson education, 5th edition and onwards.

E Resources:

3. PL/SQL study material.

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1	**Apply** the ER Modeling concepts,Normalization and design a database accordingly	L3
2	**Demonstrate** use of DDL and DML statements	L3
3	**Identify and write** SQL statements for the given end user queries	L3
4	**Demonstrate** the use of GUI tools	L3

Program Outcome of this course (POs)		PO No.
1.	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	PO2
2.	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	PO3
3.	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	PO5

Assessment methods

1. Lab Journal
2. Lab Test
3. Demo and Viva

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up:Algorithm/Flowchart/Tracing	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		
5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Graph Theory and Discrete Mathematical Structures

(Computer Science / Information Science)

Subject Code:	18DMATCS41	**Credits:**	04
Course Type:	BS	**CIE Marks:**	50
Hours/week: L – T – P	4 –0– 0	**SEE Marks:**	50
Total Hours:	50	**SEE Duration:**	3 Hours

Course Learning Objectives (CLOs):

Students should

1. Understand and apply Logic in the field of Computer science.
2. Understand the various Relations and Functions.
3. Understand advanced counting techniques.
4. Get acquainted with basic concepts of Graph Theory and their applications.
5. Get acquainted with elementary Number theory, and their properties for applications in Cryptography.

Prerequisites:

1. Set Theory
2. Power series
3. Binomial Series
4. Basics of Counting

Detailed Syllabus

Unit-I **10 hrs**

Fundamentals of Logic: Laws of Logic, Logical Implication-Rules of Inference. Quantifiers-Universal and Existential Quantifiers, Proofs Techniques: direct, indirect and Contradiction.

Unit –II **10 hrs**

Relations and Functions: Zero-One Matrices and Directed Graphs, Closure and Equivalence Relations and Partitions, Partial Orders, Hasse Diagrams, Lattice, Properties of functions, Composition and Invertible functions.

Unit III **10 hrs**

Advanced Counting Techniques: Sterling Number of second kind, Inclusion and Exclusion, Pigeonhole Principle, Generating Function, Recurrence relations, Solution of Linear homogeneous and non-homogeneous recurrence relations with constant coefficients, Divide and Conquer Algorithms, Merge sort algorithm.

Unit IV **10 hrs**

Basic Graph Theory: Definitions and Examples, Subgraphs, Complements and Graph Isomorphism, Connectivity, Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles, Coloring, Matching.

Unit V **10 hrs**

Elementary Number Theory and Cryptography: Fields, Modular Arithmetic, Prime Numbers, Fermat's and Euler's theorem. Testing of Primality, Chinese Remainder Theorem. Caesar Encryption/Decryption, RSA Cryptosystem.

Text Books:

1. Kolman, Busby, Ross "Discrete Mathematical Structures", 6th Edition Prentice Hall of India, 2010 onwards.
2. William Stallings "Cryptography and Network Security", Pearson Prentice Hall 6th Edition, 2013 onwards.
3. Kenneth H. Rosen "Discrete Mathematics and its applications", Mc Graw Hill 7th Edition.

Reference Books:

1. Ralph P Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004 onwards.
2. K. D. Joshi, "Foundations of Discrete Mathematics", 2nd Edition, New Age International Publishers, 2014 onwards.

Course Outcomes (COs): At the end of the course students will be able to:

1. **Understand** and **Apply** the Logic of Mathematics in the field of Computer science **[L2, L3]**
2. **Explain and Analyze** Different Relations and Functions. **[L2, L3]**
3. **Discuss** basic concepts of Graph Theory and its **Use** in Computer Science. **[L2, L3]**
4. **Explain** the concept of Finite Fields. **[L2]**
5. **Apply** Finite Fields to Cryptography. **[L3]**

Program Outcomes (POs) of the course: Students will acquire

1. An ability to apply knowledge of Mathematics, science and Engineering. **[PO1]**
2. An ability to identify, formulate and solve engineering problems. **[PO5]**
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice. **[PO11]**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

ENVIRONMENTAL STUDIES (MNC)

Subject Code:	18CS49	Credits:	MNC
Course Type:	HS	CIE Marks:	25 marks
Hours/week: L – T – P	2– 0– 0	SEE Marks:	-
Total Hours:	28	SEE Duration:	-

Course Learning Objectives (CLOs)

1. To understand the scope of Environmental Engineering.
2. Identify the Environmental impact due to Human activities.
3. To understand the concept of Disaster Management.
4. Identify the renewable and non renewable sources of energy.
5. Identify the various Legal aspects in Environmental Protection.

Pre-requisites: NIL

UNIT I

Definition of Environment, Ecology and Eco-system, Structure and functions of ecosystem, balanced ecosystem, Introduction to Environmental Impact Assessment.

Natural Resources: Material Cycles - Oxygen, Carbon, Nitrogen and Hydrological cycle. Importance of water quality, Water borne diseases, Water induced diseases, Significance of Fluoride in drinking water.

06 Hours

UNIT II

Energy - Different types of energy, Conventional and Non - Conventional sources – Advantages and Limitations of Wind Mills, Hydro Electric, Fossil fuel, Nuclear, Solar, Biomass and Bio-gas, Geothermal energy.

06 Hours

UNIT III

Disasters - Natural Disasters: Meaning and nature of natural disasters, their types and effects (Floods, drought, cyclone, earthquakes, Tsunami). Man Made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution and marine pollution.

06 Hours

UNIT IV

Disaster Management: International strategy for disaster reduction. Concept of disaster management and national disaster management framework

05 Hour

UNIT V

Environmental Protection: Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education. E waste and solid waste management rules

05 Hours

Text Books:

1. Benny Joseph, "**Environmental Studies**", Tata McGraw - Hill Publishing Company Limited (2005).
2. Ranjit Daniels R.J. and Jagdish Kirshnaswamy, "**Environmental Studies**", Wiley India Private Ltd., New Delhi (2009).
3. Rajagopalan R. "**Environmental Studies – From Crisis to Cure**", Oxford University Press (2005).
4. Sanjay K. Sharma, "**Environment Engineering and Disaster Management**", USP (2011).
5. Harsh K. Gupta, "**Disaster Management**", Universities Press (India) Pvt. Ltd (2003).

References Books:

1. Raman Sivakumar, "**Principles of Environmental Science and Engineering**", Second Edition, Thomson Learning, Singapore (2005).
2. Meenakshi P., "**Elements of Environmental Science and Engineering**", Prentice Hall of India Private Limited, New Delhi (2006).
3. Prakash S.M., "**Environmental Studies**", Elite Publishers, Mangalore (2007).
4. Erach Bharucha, "**Text Book of Environmental Studies**", for UGC, Universities Press (2005).
5. Tyler Miller Jr. G., "**Environmental Science – Working with the Earth**", Tenth Edition, Thomson Brooks/Cole (2004).

Course Outcomes (COs)	Bloom's Level
At the end of the course, the student will be able to	
1 **Explain** the importance of the Environment	**L2**
2 **Evaluate** Environmental disasters caused by human activities	**L5**
3 **Outline** the water stress problems and energy crisis in present era.	**L2**
4 **Explain and classify** the Renewable and Non Renewable sources of energy.	**L2**
5 **Summarize** the various Legislations related to Environment.	**L2**

Program Outcomes (POs)	
1 Graduates shall be able to understand and apply the basic mathematical and scientific concepts that underlie the field of Civil Engineering.	**PO 1**
2 Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth	**PO 8**
3 Graduates shall maintain an awareness of contemporary issues and arrive at the environmentally sustainable solutions	**PO 9**
4 Graduates shall be proficient in the core principles of Civil Engineering such as Environmental Engineering, Geotechnical Engineering, Structural Engineering and Water Resources Engineering, and shall be able to apply these principles in Engineering practice.	**PO 10**