GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY

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Semester-4 (Theory-5, Lab-3, SC-1, MC-1)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	BSC	22A0017T	Discrete Mathematical Structures	3	0	0	3
2	PCC	22A0512T	Database Management Systems	3	0	0	3
3	PCC	22A0513T	Operating Systems	3	0	0	3
4	PCC	22A0514T	Python Programming	3	0	0	3
5	HSC	22A0022T	Managerial Economics & Financial Analysis	3	0	0	3
6	PCC(LAB)	22A0515P	Database Management Systems Lab	0	0	3	1.5
7	PCC(LAB)	22A0516P	Operating Systems Lab	0	0	3	1.5
8	PCC(LAB)	22A0517P	Python Programming Lab	0	0	3	1.5
9	SC	22A0518	**Skill Oriented Course** Linux Programming	1	0	2	2
10	MC	22A0030T	**Mandatory Course** Constitution of India	2	0	0	0
Total credits							**21.5**
Honors / Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**4**	**0**	**0**	**4**

Category	**Credits**
Basic Science Course (BSC)	3
Humanities and Social Sciences Course (HSC)	3
Professional Core Courses (PCC)	13.5
Skill oriented Course (SC)	2
Total	21.5

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DISCRETE MATHEMATICAL STRUCTURES

(Common to CSE, AI&ML, DS, CS, CE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0017T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	BSC

Course Objectives:

- Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions
- Solve problems using counting techniques and combinatorics
- Introduce generating functions and recurrence relations.
- Use Graph Theory for solving real world problems

Course Outcomes (CO):

On completion of this course, student will be able to:

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems.

Syllabus		Total Hours:48
Module – I	**Mathematical Logic**	**10 Hrs**

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, functionally complete set of connectives, Mathematical Induction.

Module – II	**Set Theory**	**10 Hrs**

Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion-Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties.

Algebraic structures: Algebraic Systems-Examples and General Properties, Semigroups and Monoids, groups, sub groups, homomorphism, Isomorphism.

Module – III	**Elementary Combinatorics**	**9 Hrs**

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

Module – IV	**Recurrence Relations**	**9 Hrs**

Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution, The Method of Characteristic roots, Solutions of homogeneous Recurrence Relations.

Module – V	**Graph Theory**	**10 Hrs**

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

Text Books:

1. Joel. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists &Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Graph Theory with Applications to Engineering and Computer Science by Narsingh Deo.

Web Resources:

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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DATABASE MANAGEMENT SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0512T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To teach the role of database management system in an organization.
- To design databases using data modeling and Logical database design techniques.
- To construct database queries using relational algebra and calculus and SQL.
- To explore implementation issues in database transaction.
- To familiarize database security mechanisms.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the Basic Concepts of Database languages, Relational model, SQL.
- Choose the specific Data models for large enterprise database design.
- Analyze the data efficiently through SQL instructions.
- Apply Normal forms on database for eliminating the redundancy.
- Demonstrate the Basic Concepts of transaction management techniques.
- Apply concurrency control techniques for Database recovery.

Syllabus		Total Hours:48
Module-I	**Introduction to Database concepts and Modeling**	**10Hrs**

Conceptual Modeling Introduction: Introduction to Data bases, Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Database Systems architecture.

The Entity-Relationship Model: Overview of Database Design, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model.

Module-II	Relational Model, Relational Algebra	9Hrs

Relational Model: Introduction to the Relational Model – Integrity Constraints over Relations, Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

Relational Algebra: Introduction to Relational algebra, selection and projection, set operations, renaming, joins, division.

Module-III	SQL	10Hrs

SQL: Basic form of SQL Query, DDL, DML queries, Views in SQL, Joins, Nested & Correlated queries, Operators, predefined functions, Aggregate Functions.

PL/SQL: Introduction, Functions & Procedures, Triggers, Cursors.

Module-IV	Normalization	9Hrs

Relational database design: Introduction, Functional Dependencies (FDs), Normalization for relational databases: 1NF, 2NF, 3NF and BCNF, Basic definitions of Multi Valued Dependencies, 4NF and 5NF.

Module-V	Transaction Management &Concurrency Control and Recovery	10Hrs

Transaction Management: Transaction processing, Transaction Concept, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions.

Concurrency Control: Lock-Based Protocols, Timestamp- Based Protocols, Validation-Based Protocols, Multiple Granularity.

Recovery: Failure Classification, Recovery and Atomicity, Log-Based Recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, 6th Edition, Tata McGraw-Hill Publishing Company,2017.
2. Raghu Ramakrishnan, Database Management System, 3rd Edition, Tata McGraw-Hill Publishing Company, 2014.

Reference Books:

1. Peter Rob, A.Ananda Rao, Corlos Coronel, Database Management Systems (for JNTU), Cengage Learning, 2011.
2. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, Database System Implementation, 1st Edition, Pearson Education, United States, 2000.
3. E. Ramez and Navathe, Fundamental of Database Systems, 7th Edition, Pearson Education
4. R.P. Mahapatra & Govind Verma, Database Management Systems, Khanna Publishing House, 2016.
5. Carlos Coronel and Steven Morris, Database Systems: Design, Implementation, and Management, 12th edition, Cengage Learning,2016.
6. John V. ,Absolute beginner's guide to databases, Petersen, QUE

Web References:

1. https://www.coursera.org/learn/database-management
2. https://www.coursera.org/learn/sql-data-science
3. https://www.w3schools.com/sql/
4. https://www.youtube.com/watch?v=fHAfc7Hjq28&list=PLWPirh4EWFpGrpcMfZ6UcdI786QdtSxV8
5. https://www.youtube.com/watch?v=HwmEcudlv44&list=PL4OCRJojkV1jN-Ed6RkQpWfBvqe0utRd6
6. http://www.w3schools.in/dbms/
7. https://www.geeksforgeeks.org/dbms/
8. https://www.javatpoint.com/dbms-tutorial
9. https://www.edureka.co/blog/dbms-tutorial/

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OPERATING SYSTEMS
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0513T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Choose different Scheduling Algorithms.
- Solve Classic problems of synchronization.
- Apply various memory management techniques.
- Analyzing disk management functions and techniques.
- Implement files and directories.
- Analyze the Protection and Security mechanisms.

Course Outcomes (CO):

On completion of this course, student will be able to

- Illustrate the overall view of operating system structure. (L3)
- Analyze process scheduling algorithms and Synchronization methods. (L4)
- Solve Deadlock problems using various synchronization techniques. (L3)
- Apply memory management techniques in the design of operating systems (L3).
- Identify efficient file allocation methods for optimal disk utilization. (L3).
- Analyze Security and Protection Mechanism in Operating System (L4).

Syllabus		Total Hours:48
Module-I	**Operating Systems Overview and Structures**	**10 Hrs**

Introduction, Operating System Operations, Types of Operating Systems, functions of Operating Systems, Operating System Services, System Calls, System Programs, Operating System Structure.

Module-II	Process Management and Synchronization	10 Hrs

Process Management: Process Concepts, Process Scheduling, Operations on Processes, Inter-process Communication, Thread Models, Implementing Threads in User Space and the Kernel

Process Synchronization: Critical - Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

Module-III	Deadlocks and Memory Management	10 Hrs

Deadlocks: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Deadlock Detection, Recovery from Deadlock.

Memory Management: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Virtual Memory Management, Page-Replacement Algorithms, Thrashing, Kernel memory allocation.

Module-IV	Mass – Storage Structure and File Systems	9Hrs

Mass – Storage Structure: Disk Structure, Disk Scheduling, RAID Structure.

File Systems: Files, Directory, File System Structure, File- System Implementation, Directory Implementation.

Module-V	System Protection, System Security	9 Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats.

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Distributed Systems)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

Web References:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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PYTHON PROGRAMMING

(Common to CSE, AI&ML)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0514T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

- Introduction to Programming Basics, Binary Computation, problem-solving methods and algorithm development.
- Includes procedural and data abstractions ,program design,
- debugging, testing and documentation
- covers data types ,control structures, functions, parameter passing, library functions , arrays , Inheritance and Object oriented design

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the features, functions, strings, files of python.
- Analyze the flow control, looping statements and its functions in Python.
- Identify the methods to create and manipulate lists, and tuples.
- Apply the modular approach for solving the problems on Modules and Packages.
- Implement programs with the use of oops Concept in python.
- Apply dictionaries and files concepts for real world applications.

Syllabus		Total Hours:48
Module-I	**Introduction to Python**	**10Hrs**

Introduction: History of Python, Features of Python Programming, Applications of Python Programming, Running Python Scripts, Comments, Typed Language, Identifiers, Variables, Keywords, Input/output, Indentation, Data types, Type Checking, range( ), format( ), Math Module

Module-II	Operators Expressions and Functions	9Hrs

Operators and Expressions: Arithmetic, Assignment, Relational, Logical, Boolean, Bitwise, Membership, Identity, Expressions and Order of Evaluations, Control Statements.

Functions: Introduction, Defining Functions, Calling Functions, Anonymous Function, Fruitful Functions and Void Functions, Parameters and Arguments, Passing Arguments, Types of Arguments, Scope of variables, Recursive Functions.

Module-III	Strings, Lists, Tuples, and Dictionaries	10Hrs

Strings, Lists, Tuples, and Dictionaries: Strings- Operations, Slicing, Methods, List- Operations, slicing, Methods, Tuple- Operations, Methods, Dictionaries- Operations, Methods, Mutable Vs Immutable, Arrays Vs Lists, Map, Reduce, Filter, Comprehensions

Module-IV	Strings, Lists, Tuples, and Dictionaries	9Hrs

Files, Modules and Packages: Files- Persistent, Text Files, Reading and Writing Files, Format Operator, Filename and Paths, Command Line Arguments, File methods, Modules- Creating Modules, Import Statement, Form Import Statement, name spacing, Packages- Introduction to PIP, Installing Packages via PIP(Numpy).

Module-V	Object Oriented Programming, Errors and Exceptions	10Hrs

OOP in Python: Object Oriented Features, Classes, self variable, Methods, Constructors, Destructors, Inheritance, Overriding Methods, Data hiding, Polymorphism.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions.

Text Books:

1. Vamsi Kurama, Python Programming: A Modern Approach, Pearson, 2017.
2. Allen Downey, Think Python, 2ndEdition,Green Tea Press.

Reference Books:

1. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019.
2. Allen B. Downey, “Think Python”, 2ndEdition, SPD/O’Reilly, 2016.
3. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
4. Mark Lutz, Learning Python, 5th Edition, Orielly, 2013.

Web References:

1. https://nptel.ac.in/courses/106/106/106106145/
2. https://www.youtube.com/watch?v=MEPlLAjPvXY

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to All Branches)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0022T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	HSC

Course Objectives:

This course will enable students to:

- To understand the concepts of managerial economics and financial analysis this helps in optimal decision making in business environment.
- To have a thorough knowledge on the production theories and cost while dealing with the production and factors of production.
- To have a thorough knowledge regarding market structure and forms of business organizations in the market.
- To understand the concept of capital and capital budgeting in selecting the proposals.
- To have a thorough knowledge on recording, classifying and summarizing of transactions in preparing of final accounts.

Course Outcomes (CO):

On completion of this course, student will be able to

- Outline the Managerial Economic concepts for decision making and forward planning. Also know law of demand and its exceptions, to use different forecasting methods for predicting demand for various products and services.
- Assess the functional relationship between Production and factors of production and list out various costs associated with production
- Compute breakeven point to illustrate the various uses of breakeven analysis.
- Outline the different types of business organizations and provide a framework for analyzing money in its functions as a medium of exchange.
- Interpret various techniques for assessing the proposals of project for financial position of the business.
- Identify the principles of accounting to record, classify and summarize various transactions in books of accounts for preparation of final accounts.

Syllabus		Total Hours:48
Module-I	**INTRODUCTION TO MANAGERIAL ECONOMICS &DEMAND**	**9Hrs**

Managerial Economics – Definition – Nature & Scope - Contemporary importance of Managerial Economics - Demand Analysis - Concept of Demand - Demand Function - Law of Demand - Elasticity of Demand - Significance - Types of Elasticity - Measurement of Elasticity of Demand - Demand Forecasting - Factors governing Demand Forecasting - Methods of Demand Forecasting - Relationship of Managerial Economics with Financial Accounting and Management.

Module-II	**THEORY OF PRODUCTION AND COST ANALYSIS**	**9Hrs**

Production Function – Least-cost combination - Short-run and Long-run Production Function - Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale - Cost concepts and Cost behavior - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems) - Managerial significance and limitations of Break-Even Analysis.

Module-III	INTRODUCTION TO MARKETS ANDFORMS OF BUSINESS ORGANIZTIONS	10Hrs
Market structures - Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition – Monopoly - Monopolistic Competition – Oligopoly - Price-Output Determination - Pricing Methods and Strategies - Forms of Business Organizations - Sole Proprietorship - Partnership - Joint Stock Companies - Public Sector Enterprises.		
Module-IV	**CAPITAL AND CAPITAL BUDGETING**	**10Hrs**
Concept of Capital - Significance - Types of Capital - Components of Working Capital Sources of Short-term and Long-term Capital - Estimating Working capital requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)		
Module-V	**INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**	**10Hrs**
Accounting Concepts and Conventions - Introduction Double-Entry Book Keeping, Journal, Ledger, and Trial Balance - Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.		

Text Books:

1. Managerial Economics, PL Mehata, Sulthan Chand Publications

Reference Books:

1. Ahuja Hl “Managerial economics” 3 rd edition, Schand, ,2013
2. S.A. Siddiqui and A.S. Siddiqui: “Managerial Economics and Financial Analysis”, New Age International,. 2013.
3. Joseph G. Nellis and David Parker: “Principles of Business Economics”, 2nd edition, Pearson, New Delhi.
4. Domnick Salvatore: “Managerial Economics in a Global Economy”, Cengage, 2013.
5. Managerial Economics, Varshney &Maheswari, Sultan Chand, 2013.
6. Managerial Economics and Financial Analysis, Aryasri, 4th edition, MGH, 2019

Web References:

1. https://nptel.ac.in/courses/110101005
2. https://onlinecourses.nptel.ac.in/noc23_mg65/preview

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DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE, AI&ML, CS, DS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0515P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- Illustrate the different issues involved in the design and implementation of a databasesystem.
- Use data manipulation language to query, update, and manage a database.
- Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Outcomes (CO):

On completion of this course, student will be able to

- Apply database tools to perform various operations for the given database.
- Design database and retrieve information from database
- Develop ER diagrams and normalize the solution of a database.
- Implement the integrity constraints and PL/SQL programs to build efficient databases.
- Develop solutions for database applications using procedures and functions.
- Develop solutions for database applications using cursors and triggers.

Syllabus | **Total Hours: 48**

Experiment 1:
Practice session: Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, and use PL/SQL features like cursors on sample database.

Experiment 2:
Draw E-R diagram for library management system

Experiment 3:
Draw E-R diagram for university management system

Experiment 4:
Draw E-R diagram for hospital management system

Experiment 5:
Implement all DDL Commands

Experiment 6:
Implement all DML Commands

Experiment 7:
Implement all TCL and DCL Commands

Experiment 8:
a) Create relationship between the tables using Nested Queries
b) Implement different types of joins on tables

Experiment 9:
Implement set operations on tables

Experiment 10:
Create a table and apply various key constraints.

Experiment 11:
Views – Create a Virtual table based on the result set of an SQL statement.

Experiment 12:
a) Write a PL/SQL program to swap two numbers.
b) Write a PL/SQL program to find the largest of three numbers.

Experiment 13:
a) Write a PL/SQL program to find the total and average of 6 subjects and display the grade.
b) Write a PL/SQL program to find the sum of digits in a given number.

Experiment 14:
a) Write a PL/SQL program to display the number in reverse order.
b) Write a PL/SQL program to check whether the given number is prime or not.
c) Write a PL/SQL program to find the factorial of a given number.

Experiment 15:
Write PL/SQL programs to implement procedures and functions.

Experiment 16:
Write a PL/SQL Program on cursors

Experiment 17:
Write a PL/SQL Program to implement triggers

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke, Jeff Derstadt, Scott Selikoff and Lin Zhu,Database Management Systems solutions manual, third Edition, 2013.

References Books:

1. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

Web References:

1. http://www.scoopworld.in
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

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OPERATING SYSTEMS LAB
(Common to CSE, AI&ML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0516P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

Design and implement the concepts of operating systems such as

- CPU scheduling
- Process Management
- Memory Management
- File systems and deadlock handling using C language.

Course Outcomes (CO):

On completion of this course, student will be able to

- Analyze and simulate CPU Scheduling Algorithms.
- Solve process Synchronization problems using different algorithms.
- Apply algorithms to avoid deadlock problems.
- Implement memory management schemes and page replacement schemes.
- Analyze and simulate Disk Scheduling Algorithms.
- Simulate file allocation and organization techniques.

Syllabus | **Total Hours: 48**

Experiment 1:
Write a C program to simulate the following non-pre-emptive CPU scheduling algorithms to find turnaround time and waiting time.

a) FCFS b) SJF

Experiment 2:
Write a C program to simulate the following pre-emptive CPU scheduling algorithms to find turnaround time and waiting time.

a) Round Robin b) Priority

Experiment 3:
Write a C program to simulate producer-consumer problem using semaphores

Experiment 4:
Write a C program to simulate the concept of Dining-Philosophers problem

Experiment 5:
Write a C program to simulate Banker's algorithm for the purpose of deadlock avoidance.

Experiment 6:
Write a C program to simulate page replacement algorithms

a) FIFO b) LRU

Experiment 7:
Write a C program to simulate the following contiguous memory allocation techniques
a) Worst-fit b) Best-fit c) First-fit

Experiment 8:
Write a C program to simulate page replacement algorithms
a) Optimal b) LFU

Experiment 9:
Write a C program to simulate paging technique of memory management

Experiment 10:
Write a C program to simulate disk scheduling algorithms
a) FCFS b) SCAN

Experiment 11:
Write a C program to simulate the following file organization techniques
a) Single level directory b) Two level directory c) Hierarchical

Experiment 12:
Write a C program to simulate the following file allocation strategies.
a) Sequential b) Indexed

Reference Books:

1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth Edition, John Wiley.
2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009, Pearson Education
3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.
4. "Operating Systems", S. Haldar, A. A. Aravind, Pearson Education.
5. "Principles of Operating Systems", B. L. Stuart, Cengage learning, India Edition.2013-2014
6. "Operating Systems", A. S. Godbole, Second Edition, TMH.
7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI

Web References:

1. https://www.cse.iitb.ac.in/~mythili/os/
2. http://peterindia.net/OperatingSystems.html

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PYTHON PROGRAMMING LAB
(Common to CSE, AI&ML)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0517P	0:0:3:0	1.5	CIE: 30 SEE:70	3 Hours	PCC

Course Objectives:

This course will enable students to:

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language
- To understand the fundamentals of Python programming concepts and its applications
- To able to write Python programs for real world problems using simple and compound data types
- To employee good programming style, standards and practices during program development

Course Outcomes (CO):

On completion of this course, student will be able to

- Develop solutions to mathematical problems.
- Develop Python programs for numerical and text based problems.
- Select appropriate programming construct for solving the problem.
- Implement basic data structures in python.
- Ability to choose appropriate data structures to represent data items in real world.
- Implement and know the application of algorithms for sorting and pattern matching.

Syllabus | **Total Hours: 48**

Experiment 1:

1. Installing Python for Windows
2. Installing numpy
3. Setting the Path to Python
4. Writing Our First Python Program
5. Executing a Python Program

Experiment 2:

1. Write a program to illustrate basic concepts of value types, and variables
2. Write a program to illustrate sequences in python
3. Write a program to illustrate operators in python

Experiment 3:

1. Write a program to illustrate input & output statements in python
2. Write a program to illustrate control statements in python
3. Write a program to read number and a digit, and count the number of times the digit occurs in the number

Experiment 4:

1. Write a program to use Strings and develop a python application and analyse various string Patterns
2. Write a program that finds a given word in a string.
3. Write a program that will read a text and count all occurrences of a particular alphabet

Experiment 5:

1. Write a program to implement operations on Array.
2. Write a program to transpose a matrix.
3. Write a program to add, subtract and multiply two matrices.

Experiment 6:

1. Write a program to create a List and apply list operations in python
2. Write a program to sort the matrix
3. Write a program to find Common Elements in Two Lists
4. Write a program for the following:
   a. Removing Spaces from a String, b. Finding Sub Strings,
   c.Counting Substrings in a String, d.Replacing a String with another String

Experiment 7:

1. Write a program to create a dictionary and Implement dictionary operations in python
2. Write a program to illustrate data and time methods in python
3. Write a program to illustrate string methods in python

Experiment 8:

1. Write a program to create a module and access members from a module
2. Write a program to illustrate mathematical methods in python
3. Write a program for the following:
   a. Changing Case of a String
   b. Checking Starting and Ending of a String
   c. Sorting Strings
   d. Searching in the Strings

Experiment 9:

1. Write a program to copy content from one file to another file
2. Write a program to finding Number of Characters and Words in a given text file
3. Write a program for the following:
   a. Inserting Sub String into a String
   b. Inserting Elements in a Tuple
   c. Modifying Elements of a Tuple
   d. Deleting Elements from a Tuple

Experiment 10:

1. Write a program to getting Diagonal Elements of a Matrix
2. Write a program to find Maximum and Minimum Elements in a given set of elements
3. Write a program to find Sum and Average of Elements in a given set of elements

Reference Books:

1. Michael Dawson, ―Python Programming for absolute beginners‖, 3rd Edition, CENGAGE Learning
2. Publications, 2018.
3. Martin C. Brown, ―The Complete Reference Python‖, 4th Edition, McGraw Hill,2018
4. Allen B. Downey, ―Think Python, Second Edition, O'Reilly Media, 2017.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_cs26/preview
2. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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LINUX PROGRAMMING (SKILL)

(Common to CSE, AIML, DS, CS)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0518	1:0:2:0	2	CIE: 30 SEE:70	3 Hours	SC

Course Objectives:

This course will enable students to:

- Analyze the Linux utilities and Linux environment.
- Learn the fundamentals of shell scripting/programming.
- Understand system administration processes by providing a hands-on experience.

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand the Basic commands and utilities in Linux Environment.
- Identify and use Linux utilities to create and manage simple file processing operations,
- organize directory structures with appropriate security.
- Analyze the Linux utilities and Linux environment.
- Use shell script to automate different tasks as Linux.
- Illustrate file processing operations such as standard I/O and formatted I/O.
- Develop various client server applications using TCP or UDP protocols.

Syllabus — **Total Hours:48**

Introduction to Linux/Unix:- Architecture of Unix, Features of Unix , Unix Commands – man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, : User and session management commands: useradd, groupadd, userdel, groupdel.

Linux/Unix Utilities:- Introduction to unix file system, file handling utilities, vi editor, Text processing utilities and backup utilities: commands to be covered are tail, head, sort, nl, uniq, sed, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr and awk.
Unix Session, Standard Streams, Redirection, Pipes.

Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files

Shell Programming:
Introduction to shells, Variables, input and output, Environment variables, Basic script concepts, Expressions, Decision making and repetition etc.

Socket programming: Client Sever Implementation Using Sockets and Shared Memory

Experiment 1:
Study and Practice on various commands like man, echo, printf, clear, script, passwd, cal,uname, who, date, tty, stty, pwd, who,.

Experiment 2:
Study and Practice on various commands like cd, mkdir, rmdir cp, mv, ln, rm, unlink, du, df, mount, umount, find, unmask, ulimit, ps.

Experiment 3:
Study and Practice on various commands like tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr.

Experiment 4:

Session-1

a) Log into the system
b) Use vi editor to create a file called myfile.txt which contains some text.
c) Correct typing errors during creation.
d) Save the file
e) logout of the system

Session-2

a) Log into the system
b) open the file created in session 1
c) Add some text
d) Change some text
e) Delete some text
f) Save the Changes
g) Logout of the system

Experiment 5:

a) Login to the system
b) Use the appropriate command to determine your login shell
c) Use the /etc/passwd file to verify the result of step b.
d) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
e) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.

Experiment 6:

a) Log into the system
b) Use the cat command to create a file containing the following data. Call it mytable use tabs to separate the fields.

1425	Ravi	15.65
4320	Ramu	26.27
6830	Sita	36.15
1450	Raju	21.86

c) Use the cat command to display the file, mytable.
d) Use the vi command to correct any errors in the file, mytable.
e) Use the sort command to sort the file mytable according to the first field. Call the sorted file my table (same name)
f) Print the file mytable
g) Use the cut and paste commands to swap fields 2 and 3 of mytable. Call it my table (same name)
h) Print the new file, mytable
i) Logout of the system.

Experiment 7:

a) Write a sed command that deletes the first character in each line in a file.
b) Write a sed command that deletes the character before the last character in each line in a file.
c) Write a sed command that swaps the first and second words in each line in a file.

Experiment 8:

1. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
2. Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments toit.

Experiment 9:

1. Write a program to generate Fibonacci series
2. Write a program to check whether given string is palindrome or not
3. Write a shell script to find factorial of a given integer.

Experiment 10:

1. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported.
2. Write a shell script to list all of the directory files in a directory

Experiment 11:

1. Write an awk script to count the number of lines in a file that do not contain vowels.
2. Write an awk script to find the number of characters, words and lines in a file.
3. Write an awk script to calculate average marks of each student.
4. Write an awk script to replace a string in a file.

Experiment12:

Simulate the following commands

a) Simulate cat command b) Simulate cp command

Experiment 13:

1. Write client and server programs (using java) for interaction between server and client processes using Unix domain sockets.
2. Write client and server programs (using java) for interaction between server and client processes using Internet domain sockets.

Reference Books:

1. Sumitabha Das, "Your Unix The Ultimate Guide", Tata McGraw-Hill, New Delhi, India, 2007.
2. B. A. Forouzan and R. F. Gilberg, "Unix and Shell Programming", Cengage Learning.
3. Robert Love, "Linux System Programming", O'Reilly, SPD. Stephen G. Kochan, Patrick Wood, "Unix Shell Programming", Sams publications, 3rd Edition, 2007.
4. T. Chan, "Unix System Programming using C++", Prentice Hall India, 1999.

Web References:

1. https://nptel.ac.in/courses/117106113
2. https://archive.nptel.ac.in/courses/117/106/117106113/

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CONSTITUTION OF INDIA

(Common **to CSE, AI&ML, CS, DS, ECE, EEE, ME**)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0030T	**2:0:0:0**	**0**	**CIE: 30**	**-**	**MC**

Course Objectives:

This course will enable students to:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and Election Commission of India.
- To understand the central-state relation in financial and administrative control

Course Outcomes (CO):

On completion of this course, student will be able to

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

Syllabus		**Total Hours:48**
Module-I	**Introduction to Indian Constitution**	**10Hrs**

Introduction to Indian Constitution – Constitution -Meaning of the term - Indian Constitution Sources and constitutional history - Features– Citizenship – Preamble - Fundamental Rights and Duties - Directive Principles of State Policy.

Module-II	**Union Government and its Administration Structure of the Indian Union**	**9Hrs**

Union Government and its Administration Structure of the Indian Union - Federalism – Centre State relationship – President's Role, power and position - PM and Council of ministers - Cabinet and Central Secretariat –Lok Sabha - Rajya Sabha - The Supreme Court and High Court - Powers and Functions

Module-III	**State Government and its Administration**	**10Hrs**

State Government and its Administration - Governor - Role and Position -CM and Council of ministers - State Secretariat-Organization Structure and Functions.

Module-IV	**Local Administration**	**10Hrs**

Local Administration - District's Administration Head - Role and Importance - Municipalities - Mayor and role of Elected Representatives -CEO of Municipal Corporation Pachayati Raj - Functions– PRI –Zilla Parishath - Elected officials and their roles – CEO, Zilla Parishath - Block level Organizational Hierarchy - (Different departments) - Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Module-V	Election Commission	9Hrs

Election Commission - Election Commission- Role of Chief Election Commissioner and Election Commissione rate - State Election Commission -Functions of Commissions for the welfare of SC/ST/OBC and Women

Text Books:

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice – Hall of India Pvt. Ltd.. New Delhi
2. Subash Kashyap, "Indian Constitution", National Book Trust3. R RGaur,RAsthana,GP

Reference Books:

1. H.M.Sreevai, "Constitutional Law of India", 4th edition in 3 volumes
2. J.A. Siwach, "Dynamics of Indian Government & Politics"
3. M.V. Pylee, "Indian Constitution", Durga Das Basu, Human Rights in ConstitutionalLaw, Prentice – Hall of India Pvt. Ltd.. New Delhi
4. J.C. Johri, Indian Government and Politics Hans
5. M.V. Pylee, "Indian Constitution)

Web References:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution