M.D. UNIVERSITY, ROHTAK
SCHEME OF STUDIES AND EXAMINATION

B.TECH (Computer Science and Engineering-Data Science)
B.TECH (Computer Science and Engineering-Artificial Intelligence & Machine Learning)

SEMESTER 3rd& 4th
Scheme effective from 2021-22

COURSE CODE ANDDEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
PEC	Professional Elective Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar

B. Tech. (Computer Science and Engineering- Data Science)

B. Tech. (Computer Science and Engineering- Artificial Intelligence & Machine Learning)

Scheme of Studies/Examination w.e.f. 2021-22

Semester-3

Sr. No.	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Internal Assessment	Theory	Practical	Total	
1	PCC-CSE-202G	Discrete Mathematics	3	1	0	4	4	25	75		100	3
2	PCC-CSE-203G	Data Structures & Algorithms	3	0	0	3	3	25	75		100	3
3	PCC-CSE-251G	Digital Logic and Computer Architecture	3	0	0	3	3	25	75		100	3
4	PCC-CSE-207G	Python Programming	2	0	0	2	2	25	75		100	3
5	BSC-MATH-253G	Applied Computational Statistics	3	0	0	3	3	25	75		100	3
6	HSMC-01G	Economics for Engineers	3	0	0	3	3	25	75		100	3
7	LC-CSE-255G	Computational Statistics Lab	0	0	3	3	1.5	25		25	50	3
8	LC-CSE-257G	Digital Logic Design Lab	0	0	3	3	1.5	25		25	50	3
9	LC-CSE-213G	Data Structures & Algorithms LAB Using C	0	0	4	4	2	25		25	50	3
10	LC-CSE-215G	Python Programming LAB	0	0	2	2	1	25		25	50	3
						Total	24				800	

B.Tech. (Computer Science and Engineering- Data Science)

B.Tech. (Computer Science and Engineering- Artificial Intelligence & Machine Learning

Scheme of Studies/Examination w.e.f. 2021-22

Semester-4

Sr. No	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Internal Assessment	Theory	Practical	Total	
1	PCC-CSE-201G	Database Management Systems	3	0	0	3	3	25	75		100	3
2	PCC-CSE-250G	Programming for Data Science & AIML	3	0	0	3	3	25	75		100	3
3	PCC-CSE-206G	Operating System	3	0	0	3	3	25	75		100	3
4	PCC-CSE-252G	Object Oriented Programming With Java	3	0	0	3	3	25	75		100	3
5	HSMC-02G	Organizational Behaviour	3	0	0	3	3	25	75		100	3
6	* MC-106G	Environmental Sciences	2	0	0	2	0	-	-	-	-	3
7	PCC-CSE-254G	Fundamentals of AIML	3	0	0	3	3	25	75	-	100	3
8	LC-CSE-212G	Operating System LAB	0	0	4	4	2	25		25	50	3
9.	LC-CSE-256G	Object Oriented Programming LAB	0	0	2	2	1	25		25	50	3
10.	LC-CSE-258G	Programming for Data Science & AI Lab	0	0	2	2	1	25		25	50	3
11.	LC-CSE-209G	Database Management Systems LAB	0	0	4	4	2	25		25	50	3
						Total	24				800	

*__MC-106G__is a mandatory non –credit course in which the students will be required passing marks in theory.

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

Discrete Mathematics

Course code	PCC-CSE-202G			
Category	Professional Core Course			
Course title	Discrete Mathematics			
Scheme and Credits	L	T	P	Credits
	3	1		4
Class work	25 Marks			
Exam	75 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Sets, Relation, Function and Propositional Logic: Operations and Laws of Sets, Cartesian Products, Representation of relations, Binary Relation, Equivalence Relation, Partial Ordering Relation, POSET, Hasse Diagram, Lattices and its types, Function, Bijective functions, Inverse and Composite Function, Finite and infinite Sets, Countable and Uncountable Sets, Cantor's diagonal argument and The Power Set theorem, **S**chroeder-Bernstein theorem, Propositions, Logical operations, Conditional Statements, Tautologies, Contradictions, Logical Equivalence, The use of Quantifiers

Unit-II

Basic Counting Techniques and Recurrence Relation: Pigeon-hole principle, Permutation and Combination**,** the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic., Linear recurrence relation with constant coefficients, Homogenous Solutions, Particular Solutions, Total Solutions, Solving recurrence relation using generating functions

Unit-III

Algebraic Structures: Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Unit-IV

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Multigraph and Weighted graph, Shortest path in Weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formulae, Graph Colouring, Trees, Binary trees and its traversals, Trees Sorting, Spanning tree, Minimal Spanning tree

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Satinder Bal Gupta: A Text Book of Discrete Mathematics and Structures, University Science Press, Delhi.
3. C. L. Liu and D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata McGraw – Hill.
4. J.P. Tremblay and R. Manohar, Discrete mathematical structures with applications to computer science, TMG Edition, Tata McGraw-Hill
5. Discrete Mathematics, Babu Ram, Pearson Publication
6. Discrete Mathematics, Semyour Lipschutz and Marc Lipson, Schaum's outline

Course Outcomes

The students will learn

1. To solve mathematical problems based on concepts of set theory, relations, functions and lattices.
2. To express logic sentence in terms of quantifiers and logical connectives.
3. To apply basic counting techniques to solve permutation and combination problems.
4. To solve recurrence relations.
5. To classify algebraic structure of any given mathematical problem.
6. To evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
   To develop the given problem as graph networks and solve with techniques of graph theory.

Data Structure & Algorithms

Course code	PCC-CSE-203G			
Category	Professional Core Course			
Course title	Data Structure & Algorithms			
Scheme and Credits	L	T	P	Credits
	3	0	0	3
Class work	25 Marks			
Exam	75 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Unit 1

Introduction: Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.

Unit 2

Stacks and Queues: Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. Queue Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit 3

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Unit 4

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested books:

"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, and Computer Science Press.

Suggested reference books:

Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
"How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Course outcomes

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Digital Logic and Computer Architecture

Course code	PCC-CSE-251G				
Category	Professional Core Course				
Course title	Digital Logic and Computer Architecture				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Course Objectives:

- To understand the basic theoretical concepts of digital systems like the binary system and Boolean algebra.
- To express real life problem in logic design terminology.
- To use Boolean algebraic formulations to design digital systems. To design using combinational/sequential circuits
- To understand the Instruction execution stages and the functions of the various computer hardware components.

UNIT- I

Number Systems & Digital Logic Circuits Overview: Data Representation, point ; Number base conversions, complements, codes, Logic Functions- Basic Logic Functions, Logic gates, universal logic gates, Boolean Algebra, Minimisation and realisation of switching circuits/logical expressions; Combinational circuits **;** Design of synchronous sequential circuits.

UNIT- II

Computer Arithmetic: Algorithms for fixed point and floating point addition, subtraction, multiplication and division operations. Hardware Implementation of arithmetic and logic operations, High performance arithmetic.

Instruction Set & Addressing: Memory Locations and Addresses, Machine addresses and sequencing, Various Addressing Modes, Instruction Formats, Basic Machine Instructions. IA-32 Pentium example.

UNIT- III

Processor Organization: CPU, ALU ,Register Transfers, Execution of Instructions, Multiple Bus Organization, Control unit design: hardwired and microprogrammed; Memory Organization: Concept of Memory, RAM, ROM memories, memory hierarchy, cache memories, virtual memory, secondary storage, memory management requirements.

UNIT-IV

Input / Output Organization: Introduction to I/O, Interrupts- Hardware, Enabling and disabling Interrupts, Device Control, Programmed I/O, Direct memory access, buses, interface circuits, standard I/O Interfaces.

Recent trends; Overview of currently used HDLs in industry.

TEXT BOOKS:

- Digital Logic and Computer Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
- Computer Organization – Carl Hamacher, Zvonko Vranesic, Safwat Zaky, fifth edition, McGraw Hill.
- Computer Architecture and Organization- An Integrated Approach, Miles Murdocca, Vincent Heuring, Second Edition, Wiley India.
- Computer Systems Architecture – M. Moris Mano, III Edition, Pearson.

REFERENCE BOOKS:

1. Computer Organization and Architecture – William Stallings Sixth Edition, 2010 Pearson
2. Computer- organization and Design- David A. Paterson and John L. Hennessy, Elsevier.
3. Fundamentals or Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition.
4. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.
5. Digital Principles and Applications, 6/e, A. P. Malvino, D. K. Leach and G. Saha, McGraw Hill, 2006.
6. Computer Organization and Design, D. A. Patterson and J. L. Hennessy, 3/e, Morgan Kaufmann, 2006.
7. The INTEL Microprocessors, Barry B. Brey, 8/e, Prentice Hall, 2008.

Course Outcomes:

- Student could able to design, understand the number systems, combinational sequential circuits. And they should be in a position to continue with computer organization.
- Students understand in a better way the I/O and memory organization in depth.
- They should be in a position to write assembly language programs for various applications.
- Acquire design thinking capability, ability to design a component with realistic constraints, to solve real world engineering problems and analyze the results.

Python Programming

Course code	PCC-CSE-207G			
Category	Professional Core Course			
Course title	Python Programming			
Scheme and Credits	L	T	P	Credits
	2	0	0	2
Class work	25 Marks			
Exam	75 Marks			
Total	100 Marks			
Duration of Exam	03 Hours			

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of Python programming.
- To understand syntax of Python language
- To create dynamic applications in Python language.
- To implement object oriented concepts using Python language

Unit 1

Introduction: Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; numerical types; arithmetic operators and expressions; Control statements, Loops and Selection statements; String manipulations: subscript operator, indexing, slicing a string; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file.

Unit 2

Lists, dictionary and Design with functions: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity; arguments and return values; Program structure and design; Recursive functions.

Unit 3

Simple graphics and image processing: Simple graphics, Turtle operations, Manipulating turtle screen, Drawing two dimensional shapes, examining an object attributes, Taking a random walk, Color and RGB scheme, Image processing: Image manipulation operations, properties of images, image module, copying, blurring and reducing image. Graphical User Interfaces: Terminal based and GUI based programs, Simple GUI-Based Programs, Windows and Window Components, Input and Output with Entry Fields, Defining and Using Instance Variables, Other Useful GUI Resources.

Unit 4

Object Oriented concepts: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects, Inheritance, polymorphism, operator overloading; abstract classes; exception handling, try block. Multithreading: Threads and Processes, Sleeping Threads, Producer, Consumer, and Synchronization, The Readers and Writers Problem, Shared Cell Class, Thread-Safe Class

Course outcomes

- For a given conceptual problem student will able to analyze the problem and write a program in python with basic concepts.
- For a given problem of Strings and texts, student will able to analyze the problem and write a program in python with basic concepts involving strings and texts.
- The knowledge of list and dictionary will enable student to implement in python language and analyze the same.
- Student will able to write a program using functions to implement the basic concepts of object oriented programming language

Suggested books:

Fundamentals of Python: First Programs" Kenneth Lambert, Course Technology, Cengage Learning, 2012

Suggested reference books:

Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", By Charles Dierbach, John Wiley & Sons, December 2012,

Applied Computational Statistics

Course code	BSC-MATH-253G				
Category	Basic Science Course				
Course title	Applied Computational Statistics				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the basics of data, exploratory data analysis, statistics and hypothesis testing in problem solving.
2. Illustrate multivariate data analysis methods to solve the problems.
3. Understand the concepts of classification methods to analysis and representation of multivariate data in real world.
4. Understand and illustrate the stochastic process to solve real world problems.

Unit-I

Types of Data (Quantitative, Qualitative, Logical), Exploratory Data Analysis (Histogram, Scatter plots, Box plot, Fundamentals of Descriptive Statistics (moments- Measures of Central Tendency, Measure of spread, Measure Shape), Overview of Probability and Combinatorics, Inferential Statistics (Normal Distribution, Statistic Sampling, Central Limit Theorem), Estimations (Point and Intervals- Confidence intervals with means, sample proportions), Hypothesis Testing :Introduction, Confidence Intervals, Critical Value based approach, P-value base approach, ZTests, TTests ,the $\chi 2$ distribution, ANOVA/ANCOVA.

Unit-II

Multivariate Analysis: Multivariate distributions: multivariate normal distribution and its properties, distributions of linear and quadratic forms, tests for partial and multiple correlation coefficients and regression coefficients and their associated confidence regions. Data analytic illustrations. Wishart distribution (definition, properties), construction of tests, union-intersection and likelihood ratio principles, inference on mean vector, Hotelling's T2. MANOVA- Inference on covariance matrices.

Unit-III

Classification methods: Discriminant analysis, principal component analysis and factor analysis, Canonical Correlation analysis, Correspondence Analysis, Multidimensional Scaling, Cluster analysis. Nonparametric and robust methods of multivariate analysis. Graphical representation of multivariate data.

Unit-IV

Stochastic Process: Markov chains with stationary transition probabilities, properties of transition functions, classification of states, Stationary distribution of a Markov chain, existence and uniqueness, convergence to the stationary distribution. Methods based on Markov chains for simulation of random vectors. MCMC algorithm. Random Walks, queueing processes, branching processes. Gambler's ruin problem, transient states.

References:

1. W. Feller: *An Introduction to Probability Theory and its Applications,* Vol.-II.
2. S. Karlin and H. M. Taylor, *A First Course in Stochastic Processes*.
3. William J. Stewart, *Probability, Markov Chains, Queues and Simulation*.
5. P. G. Hoel, S. C. Port and C. J. Stone, *Introduction to Stochastic Processes*.
6. S. Ross, *Introduction to Probability Models*.
7. T. W. Anderson, *An Introduction to Multivariate Statistical Analysis*.
8. Ross, Introduction to Probability. 9th edition, Pearson, 2006
9. G. Jay Kerns, Introduction to Probability and Statistics Using R, 2016
10. Andy Field, An Adventure in Statistics, SAGE Publications, 2016
11. Dawn Griffiths, Head First Statistics, O'Reilly media Inc., 2019
12. Timothy C Urdan, Statistics in Plain English, Taylor and Francis Publisher, 2010
13. Brian.S. Everitt, Torsten Hothorn, Handbook of Statistical Analyses Using R, Chapman & Hall/CRC 2006
14. C.R. Kothari, Research Methodology, New Age Publishers, 2004
15. Marley W. Watkins, A step by Step Guide to Exploratory Factor Analysis with R and R Studio, Tylor & Francis Group, 2021
16. Josheph F. Hair, William C. Black et.al., Multivariate Data Analysis, 7^{th} ed.
17. Deniel J. Denis, Univariate, Bivariate and Multivariate Statistics Using R, John Wiley & Sons, 2020
18. A. Basilevsky, Statistical Factor Analysis & Related Methods – Theory & Applications, John Wiley & Sons

ECONOMICS FOR ENGINEERS

Course code	HSMC- 01G				
Category	Humanities/ Social Sciences/ Management				
Course title	Economics For Engineers				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Branches (B. Tech.)	Common For All Branches				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Course Objectives:

1. Acquaint the students to basic concepts of economics and their operational significance.
2. To stimulate the students to think systematically and objectively about contemporary economic problems.

UNIT-1

Definition of Economics- Various definitions, types of economics- Micro and Macro Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors effecting it, its practical application and importance,

UNIT 2

Production- Meaning of Production and factors of production, Law of variable proportions, and Returns to scale, internal external economies and diseconomies of scale. Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Realcost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT-3

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).

Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT-4

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits.

Globalization of Indian economy - merits and demerits.

Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions, Difference between Commercial & Central Bank.

COURSE OUT COMES:

1. The students will able to understand the basic concept to economics.
2. The student will able to understand the concept to production and cost.
3. The student will able to understand the concept of market.
4. The student will able to understand the concept of privatization, globalization and banks.

REFERENCES:

1. Jain T. R., Economics for Engineers, V K Publication.
2. Chopra P. N., Principle of Economics, Kalyani Publishers.
3. Dewett K. K., Modern economic theory, S. Chand.
4. H. L. Ahuja., Modern economic theory, S .Chand.
5. Dutt Rudar & Sundhram K. P. M., Indian Economy.
6. Mishra S. K., Modern Micro Economics, Pragati Publications.
7. Singh Jaswinder, Managerial Economics, dreamtech press.
8. A Text Book of Economic Theory Stonier and Hague (Longman's Landon).
9. Micro Economic Theory–M. L. Jhingan (S. Chand).
10. Micro Economic Theory-H. L. Ahuja (S. Chand).
11. Modern Micro Economics: S. K. Mishra (Pragati Publications).
12. Economic Theory-A. B. N. Kulkarni & A. B. Kalkundrikar(R. Chand & Co).

Computational Statistics Lab

Course code	LC-CSE-255G				
Category	Laboratory Course				
Course title	Computational Statistics Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

- **Firstly, give a basic insight of R/Mat Lab and its various libraries, R as a Data Importing Tool, Simulation and Hypothesis testing, Simulation, Model building, Evaluation and Deployment, Bayesian computation, Fitting a line with Bayesian techniques and more which requires as per content of Applied Computational Statistics.**

- **Secondly, Experiments/Programs in R/Mat Lab related to the course contents of Applied Computational Statistics can be designed and developed by the subject faculty.**

Digital Logic Design Lab

Course code	LC-CSE-257G				
Category	Laboratory Course				
Course title	Digital Logic Design Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Indicative Experiments

1. **Perform following program using Bread Board**
   1. Realization of Logic gates using discrete components, verification of truth table for logic gates, realization of basic gates using NAND and NOR gates
   2. Implementation of Logic Circuits by verification of Boolean laws and verification of De Morgans.
   3. Adder and Subtractor circuit realization by implementation of Half-Adder and Full-Adder and by implementation of Half-Subtractor and Full-Subtractor.
   4. Combinational circuit design
      i. Design of Decoder and Encoder
      ii. Design of Multiplexer and De multiplexer
      iii. Design of Magnitude Comparator
      iv. Design of Code Converter
   5. Sequential circuit design
      i. Design of Mealy and Moore circuit
      ii. Implementation of Shift registers
      iii. Design of 4-bit Counter
      iv. Design of Ring Counter.

2. **Study of working and usage of TASM/MASM.**
   Perform following program using TASM/MASM-
   - Addition and Subtraction of 8/16-bit number
   - Multiplication of 8-bit number
   - Factorial of a given number
   - Design of Half Adder
   - Design of Full Adder
   - Square root of a number

3. **Study of Concepts and working of HDL modeling and logic simulation.**
   Perform following program using HDL modeling and simulation-
   i. Program to realize delay and stimulus in simple circuit
   ii. Design and implement code converters using logic gates simulation
   iii. Program for combinational circuits
   iv. Program for Sequential circuits
   v. Registers and Counters
   vi. Program to implementation of Flip-Flop
   vii. Program to implement SISO, SIPO, PISO and PIPO shift registers using Flip- flops

4. **Implementation of different circuits to solve real world problems:**
   A digitally controlled locker works based on a control switch and two keys which are entered by the user. Each key has a 2-bit binary representation. If the control switch is pressed, the locking system will pass the difference of two keys into the controller unit. Otherwise, the locking system will pass the sum of the two numbers to the controller unit. Design a circuit to determine the input to the controller unit.

5. **Implementation of different circuits to solve real world problems:**
   A bank queuing system has a capacity of 5 customers which serves on first come first served basis. A display unit is used to display the number of customers waiting in the queue. Whenever a customer leaves the queue, the count is reduced by one and the count is increased by one if a customer joins a queue. Two sensors (control signals) are used to sense customers leaving and joining the queue respectively. Design a circuit that displays the number of customers waiting in the queue in binary format using LEDs. Binary 1 is represented by LED glow and 0 otherwise.

TEXT BOOKS:

- Digital Logic & Computer Design – Third Edition, M.Morris Mano, Pearson Education/PHI.
- Computer Organization – Carl Hamacher, Zvonko Vranesic, Safwat Zaky, fifth edition, McGraw Hill.
- Computer Architecture and Organization- An Integrated Approach, Miles Murdocca, Vincent Heuring, Second Edition, Wiley India.
- Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson.

Data Structures and Algorithms Lab Using C

Course code	LC-CSE-213G				
Category	Laboratory Course				
Course title	Data Structures and Algorithms Lab Using C				
Scheme and Credits	L	T	P	Credits	
	0	0	4	2	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Data Structures Lab List of practical exercises, to be implemented using object-oriented approach in C++ Language.

1. **Write a menu driven program that implements following operations (using separate functions) on a linear array:**
   - Insert a new element at end as well as at a given position
   - Delete an element from a given whose value is given or whose position is given
   - To find the location of a given element
   - To display the elements of the linear array

2. **Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions):**
   - Insert a new element
   - Delete an existing element
   - Search an element
   - Display all the elements

3. Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.
4. Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.
5. Program to demonstration the implementation of various operations on a linear queue represented using a linear array.
6. Program to demonstration the implementation of various operations on a circular queue represented using a linear array.
7. Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).
8. Program to illustrate the implementation of different operations on a binary search tree.
9. Program to illustrate the traversal of graph using breadth-first search
10. Program to illustrate the traversal of graph using depth-first search.

11. Program to sort an array of integers in ascending order using bubble sort.

12. Program to sort an array of integers in ascending order using selection sort.
13. Program to sort an array of integers in ascending order using insertion sort.
14. Program to sort an array of integers in ascending order using radix sort.
15. Program to sort an array of integers in ascending order using merge sort.
16. Program to sort an array of integers in ascending order using quick sort.
17. Program to sort an array of integers in ascending order using heap sort.
18. Program to sort an array of integers in ascending order using shell sort.
19. Program to demonstrate the use of linear search to search a given element in an array.
20. Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

Python Programming Lab

Course code	LC-CSE-215G				
Category	Laboratory Course				
Course title	Python Programming Lab				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Objectives

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, and dictionaries.
- Read and write data from/to files in Python.

List of Programs

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
5. Find the maximum of a list of numbers
6. Linear search and Binary search
7. Selection sort, Insertion sort
8. Merge sort
9. First n prime numbers
10. Multiply matrices
11. Programs that take command line arguments (word count)
12. Find the most frequent words in a text read from a file
13. Simulate elliptical orbits in Pygame
14. Simulate bouncing ball using Pygame

Outcome:

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

Database Management System

Course code	PCC-CSE-201G				
Category	Professional Core Course				
Course title	Database Management System				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Objectives of the course

a. To understand the different issues involved in the design and implementation of a database system.
b. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
c. To understand and use data manipulation language to query, update, and manage a database
d. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
e. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit: 1

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit: 2

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit: 3

Storage strategies: Indices, B-trees, hashing,

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit: 4

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Suggested books:

Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Suggested reference books

1. Principles of Database and Knowledge – Base Systems, Vol 1 by J. D. Ullman, Computer Science Press.
2. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
3. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Course Outcomes

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement, design the databases using E R method and normalization.
3. For a given specification, construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

Programming for Data Science & AIML

Course code	PCC-CSE-250G				
Category	Professional Core Course				
Course title	Programming for Data Science & AIML				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course:

- To impart the basic concepts of Python programming.
- To understand concepts and usage of NumPy and Pandas package for numerical data calculations in Python.
- To understand concepts and applications of various data visualization tools of Python on real world data.
- To understand and implement the Machine Learning Concepts in Python.

Unit 1

Overview of Python Programming Concepts: The concept of data types; variables, assignments; numerical types; operators and expressions; Control Structures; String manipulations; File Handling – creating, reading/writing text/number files; Dictionaries; Functions; OOPs Concepts

Unit 2

Introduction to Numpy - Creation on Array ,Array generation from Uniform distribution, Random array generation, reshaping, maximum and minimum, reshaping, Arithmetic operations, Mathematical functions, Bracket Indexing and Selection, Broadcasting, Indexing a 2D array (matrices);

Data Manipulation with Pandas -Creating a Series - from lists, arrays and dictionaries, Storing data in series from intrinsic sources, Creating Data Frames, Imputation, Grouping and aggregation, Merging, Joining, Concatenation, Find Null Values or Check for Null Values, Reading data from csv, txt, excel, web.

Unit 3

Introduction to Visualization - Installing and setting up visualization libraries, Canvas and Axes, Subplots, Common plots – scatter, histogram, boxplot, Logarithmic scale, Placement of ticks and custom tick labels, Pandas Viz, Style Sheets, Plot type, Area, Barplots, Histograms, Line Plots, Scatter Plots, BoxPlots, Hexagonal Bin Plot, Kernel Density Estimation plot (KDE), Distribution Plots, Categorical Data Plots, Combining Categorical Plots, Matrix Plots, Regression Plots, Grids; Python Visualizations toolkits/libraries.

Unit4

Introduction to Machine Learning with SciKit-Learn & PyTorch– Data Representation and basic functions- Estimator, parameters & model validation, Model Selection, Curve, Grid search, Feature engineering, Naive Bayes Classification, Linear regression, SVM etc; Overview of other Python ML/Deep Learning toolkits/Libraries.

Introduction to NLP with NLTK and its functions, modules like speech tagging, tokenization, parsing, segmentation, recognition , cleaning & normalization of text etc; Overview of other Python NLP toolkits/Libraries.

Course outcomes

- Understand and implement the basics of programming in Python.
- Apply the Numpy package for numerical calculations in Python.
- Apply Pandas package for loading and preprocessing data in Python.
- Implement various data visualization tools of Python on real world data.
- Understand and implement the Machine Learning Concepts in Python.

Textbooks:

1. Charles Dierbach., *Introduction to Python using Computer Science*, Wiley Publications, Second Edition, 2015
2. Mark Lutz , *Learning Python*, O'Reilly publications , Fifth Edition, 2015
3. Jake Vandar Plas, Python Data Science Handbook, O'Reilly , 2016

Reference Books:

Paul Barry, *Head First Python*, Orielly Publications, Second Edition, 2010

Reference Websites: (nptel, swayam, coursera, edx, udemy, official documentation weblink)

https://swayam.gov.in/nd1_noc19_cs59/preview

https://www.python.org/

https://www.datacamp.com/

Operating System

Course code	PCC-CSE-206G				
Category	Professional Core Course				
Course title	Principles of Operating System				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Branches (B. Tech.)	Computer Science and Engineering				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT 1

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services.

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of threads, Types of threads, Multithreading.

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

UNIT 2

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

UNIT 3

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures –Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

UNIT 4

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks. Case study on UNIX and WINDOWS Operating System.

Suggested books:

- Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
- Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Suggested reference books:

- Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
- Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
- Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
- Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Course Outcomes:

CO1: Understand the structure and architectural components of OS to analyze and design the applications to run in parallel. Moreover, students would be able to develop scheduling algorithms to optimize various parameters like CPU utilization, Throughput, Turnaround Time, Waiting Time, and Response Time for research purpose.

CO2: Understand the design issues associated with Operating system (e.g. Mutual exclusion, Deadlock detection etc.) to gain insight towards developing algorithms/techniques for efficient deadlock handling.

CO3: For a given specification of memory organization, develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.

CO4: Design and implement file management system for a given specification. Identify, use and evaluate the disk management policies with respect to various performance evaluation parameters.

Object Oriented Programming with Java

Course code	PCC-CSE-252G				
Category	Professional Core Course				
Course title	Object Oriented Programming with Java				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note:
Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

COURSE OBJECTIVES:

1. Understand the basic object oriented programming concepts and apply them in problem solving.
2. Illustrate inheritance concepts for reusing the program.
3. Demonstrate on the multi-tasking by using multiple threads.
4. Develop data-centric applications using JDBC and understand the basics of java console and GUI based programming.

Unit-I

OOPS CONCEPTS AND JAVA PROGRAMMING OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm.

Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java standalone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.

Unit-II

MULTIPLE INHERITANCE ,INTERFACES AND PACKAGES - Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.

Unit-III

EXCEPTION HANDLING AND MULTITHREADING-Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, re throwing exceptions, exception specification, built in exceptions, creating own exception sub classes.

MULTITHREADING-Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

Unit-IV

FILES AND CONNECTING TO DATABASE- Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC.

GUI PROGRAMMING AND APPLETS- GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components. Containers: J Frame, J Applet, J Dialog, J Panel, overview of some swing components: J Button, J Label, J Text Field, J Text Area, simple applications. Layout management: Layout manager types, border, grid and flow. Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

Text Books:

1. Herbert Schildt and Dale Skrien,"Java Fundamentals – A comprehensive Introduction", McGraw Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the complete reference", Mc Graw Hill, Osborne, 7th Edition, 2011.
3. T. Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

Reference Books:

1. P. J. Dietel and H. M. Dietel, "Java How to program", Prentice Hall, 6th Edition, 2005.
2. P. Radha Krishna, "Object Oriented programming through Java", CRC Press, 1st Edition, 2007.
3. S. Malhotra and S. Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.

Web References:

1. http://java.sun.com
2. http://www.oracle.com/technetwork/java/index.html)
3. http://java.sun.com/javase
4. http://www.oracle.com/technetwork/java/javase/overview/index.html
5. http://download.oracle.com/javase/7/docs/api/index.html

E-Text Books:

1. https://cse.iitkgp.ac.in/~dsamanta/java/index.htm, E-book on OOPs using Java by Dr. Debasis
2. http://docs.oracle.com/javase/tutorial/
3. https://www.iiti.ac.in/people/~tanimad/JavaTheCompleteReference.pdf
4. https://www.codejava.net/books/4-best-free-java-e-books-for-beginners

COURSE OUTCOMES (COs):

Use object oriented programming concepts to solve real world problems.

ORGANIZATIONAL BEHAVIOUR

Course code	HSMC-02G				
Category	Humanities/ Social Sciences/ Management				
Course title	Organizational Behaviour				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Objectives of the course: The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.

UNIT 1

Introduction of Management- Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management & Importance of management. Difference between management and administration.

UNIT 2

Introduction of organization:-Meaning and process of Organization, Management v/s Organization; **Fundamentals of Organizational Behavior:** Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB. **Individual Processes and Behavior**- **Personality**- Concept, determinants and applications; **Perception-** Concept, process and applications, **Learning**- Concept (Brief Introduction) ; **Motivation-** Concept, techniques and importance.

UNIT 3

Interpersonal Processes- **Teams and Groups**- Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team and group, **Conflict-** Concept, sources, types, management of conflict; **Leadership:** Concept, function, styles & qualities of leadership. **Communication –** Meaning, process, channels of communication, importance and barriers of communication.

UNIT 4

Organizational Processes: Organizational structure - Meaning and types of organizational structure and their effect on human behavior; **Organizational culture -** Elements, types and factors affecting organizational culture. **Organizational change:** Concept, types & factors affecting organizational change, Resistance to Change.

Suggested Text books:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, Organisational Behaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding Organisational Behaviour, Oxford University Press, New Delhi.
6. Robbins, S.P. & Judge, T.A., Organisational Behaviour, Prentice Hall of India, New Delhi.
7. Ghuman Karminder, Aswathappa K., Management concept practice and cases, Mc Graw Hill education.
8. Chhabra T. N., Fundamental of Management, Sun India Publications NewDelhi.

Course Outcomes:

By the end of this course the student will be able to:

1. Students will be able to apply the managerial concepts in practical life.
2. The students will be able to understand the concept of organizational behavior at individual level and interpersonal level.
3. Students will be able to understand the behavioral dynamics in organizations.
4. Students will be able to understand the organizational culture and change

Environmental Sciences

Course code	MC-106G				
Category	Mandatory Course				
Course title	Environmental Sciences				
Scheme and Credits	L	T	P	Credits	
	3	0	1	0	
Branches (B. Tech.)	Common For All Branches				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Unit-1 the Multidisciplinary nature of environment studies. Definition, scope and importance. (2 lecture)

Unit-2 Natural Resources (7 Lectures): Renewable and non-renewable resources: Natural resources and associated problems.

a) Forest resources: Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Water logging, salinity, case studies.
e) Energy resources: Growing energy needs; renewable and non-renewable energy sources, use of alternate energy sources, case studies.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
g) Role of an individual in conservation of natural resources.
h) Equitable use of resources for sustainable lifestyles.

Unit-3 Ecosystems (6 lectures):

a) Producers, consumers and decomposers.
b) Energy flow in the ecosystem.
c) Ecological succession.
d) Food chains, food webs and ecological pyramids.
e) Introduction, types, characteristic features, structure and function of the following eco-system :
f) Forest ecosystem.
g) Grassland ecosystem.
h) Desert ecosystem.
i) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-4 Biodiversity and its conservation (8 lectures):

a) Introduction - Definition: Genetic, Species and ecosystem diversity.
b) Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
c) Biodiversity at global, National and local levels.
d) India as a mega-diversity nation.
e) Hot-spots of biodiversity.
f) Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
g) Endangered and endemic species of India.
h) Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Unit-5 Environmental pollution (8 lectures): Definition, causes, effects and control measures of:

a) Air pollution.
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards
    * Solids waste management: causes, effects and control measures of urban and industrial wastes.
    * Role of an individual in prevention of pollution.
    * Pollution case studies.
    * Disaster management: floods, earthquake, cyclone and landslides.

Unit-6 Social issues and the Environment (7 lectures):

- From unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people: its problems and concerns case studies.
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of pollution) Act.
- Water (Prevention and Control of pollution) Act.
- Wildlife Protection Act.
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit-7 (6 lectures)
Human population and the Environment, Population growth, variation among nations, Population explosion- Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Woman and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Unit-8 Field Work (Field work equal to 10 lecture hours):

- Visit to a local area to document environmental assets - river/forest/grassland/hill/mountain.
- Visit to a local polluted site-urban/Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems- pond, river, hill slopes, etc.

References

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha, Frach, The Biodiversity of India, MApin Publishing Pvt. Ltd. Ahmedabad-380013, India, E-mail: mapin@icenet.net (R).
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine pollution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai 1196 p.
6. De A.K., Environmental Chemistry, WileyEastern Ltd.
7. Down to Earth, Centre for Science and Environment (R).
8. Gleick, H.P., 1993. Water in crisis, Pacific Institute for Studies in Dev. Environment & Security Stockholm Env. Institute, Oxford Univ. Press, 473p.

9. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural HistorySociety, Bombay(R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge Uni. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
12. Mackinney, M.L. & Schoch, RM 1996, Environmental Science systems & solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Mayyer Hazardous, Tekchno-Science Publications (TB). Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Datta, A.K. 1987 Waste Water Treatment. Oxford & TBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma, B.K. 2001, Environmental Chemistry, Goal Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J. and Michael Begon. Essentials of Ecology, Blackwell Science (TB).
20. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Comliances and Standards, Vol. I and II Enviro Media (R).
21. Tridevi R.K. and P.K. Goal, Introduction to air pollution, Techno Science Publications (TR).
22. Wagner K.D., 1998, Environmental Management, W.B. Saunders co. Philadelphia, USA 499p.
23. Atext book environmental education G.V.S. Publishers byDr. J.P. Yadav.

The scheme of the paper will be under:

The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded.
The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.

Exam. Pattern: In case of awarding the marks, the paper will carry 100 marks.
Theory: 75 marks, Practical/ Field visit: 25 marks. The structure of the question paper will be:

Part- A: Short Answer Pattern	:	15 marks
Part- B: Essay Type with inbuilt choice	:	60 marks
Part-C: Field Work (Practical)	:	25 marks

Instructions for Examiners :

Part- A: Question No. 1 is compulsory and will contain five short- answer type question of 3 marks each covering the entire syllabus.

Part-B: Eight essay type questions (with inbuilt choice) will be set from the entire syllabus and the candidate will be required to answer any four of them. Each essay type question will be of 15 marks.

The examination of the regular students will be conducted by the concerned college/Institute. Each student will be required to score minimum 40% marks separately in theory and practical/Field visit. The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students.

Fundamentals of AIML

Course code	PCC-CSE-254G				
Category	Professional Core Course				
Course title	Fundamentals of AIML				
Scheme and Credits	L	T	P	Credits	
	3	0	0	3	
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Learning & Course Outcomes:

On completion of this course, the students are expected to -
1. Understand the very basics and Uses of Artificial Intelligence (AI)
2. Understand the basics and uses of Machine Learning (ML)
3. Understand the Application of AI by domain and its current research trends.
4. Understand the societal impact of AIML, explainable AI and data analytics

UNIT – I

Introduction to AI: What is AI, Turing test, cognitive modeling approach, law of thoughts, the relational agent approach, the underlying assumptions about intelligence, techniques required to solve AI problems, level of details required to model human intelligence, successfully building an intelligent problem, history of AI

UNIT – II

Introduction to Machine Learning: What is Machine Learning, Learning from Data, History of Machine Learning, Big Data for Machine Learning, Leveraging Machine Learning, Descriptive vs Predictive Analytics, Machine Learning and Statistics, Artificial Intelligence and Machine Learning, Types of Machine Learning – Supervised, Unsupervised, Semi-supervised, Reinforcement Learning, Types of Machine Learning Algorithms, Classification vs Regression Problem, Bayesian, Clustering, Decision Tree, Dimensionality Reduction, Neural Network and Deep Learning, Training machine learning systems

UNIT – III

AI Research Trends: Research trends in machine learning, deep learning, reinforcement learning, robotics, computer vision, natural language processing, collaborative systems, algorithmic game theory, internet of things (Io T), neuromorphic computing

Applications of AI by domain: Transportation, home/service robots, healthcare, education, low- resource communities, public safety and security, employment and workplace, entertainment, finance, banking and insurance

UNIT – IV

Role of Artificial Intelligence in Society: Societal challenges AI presents, Ethical and Societal implications, policy and law for AI, fostering dialogue, sharing of best practices

Malicious Use of AI: Prevention and Mitigation: Security relevant properties of AI, Security domains and scenarios: digital security, physical security, political security, factors affecting the equilibrium of AI and security

Explainable AI: Introduction to explainable AI, why explainable AI, interpretability and explain ability, methods of interpretability and explain ability

Introduction to Data Analytics: Working with Formula and Functions, Introduction to Charts, Logical functions using Excel, Analyzing Data with Excel.

Reference Books:

1. Artificial Intelligence 3e: A Modern Approach Paperback – By Stuart J Russell & Peter Norvig; Publisher – Pearson
2. Artificial Intelligence Third Edition By Kevin Knight, Elaine Rich, B. Nair – Mc Graw Hill
3. Artificial Intelligence Third Edition By Patrick Henry Winston – Addison-Wesley Publishing Company
4. Machine Learning using Pytho, U Dinesh Kumar, Manaranjan Pradhan, John Wiley & Sons.
5. A Classical Approach to Artificial Intelligence, M. C. Trivedi, Khanna Publishing House.
6. Machine Learning, V. K. Jain, Khanna Publishing House.
7. Advanced Data Analytics Using Python: With Machine Learning, Deep Learning, Sayan Mukhopadhyay, Apress.
8. Machine Learning for Absolute Beginners: A Plain English Introduction, 2nd ed., Oliver Theobal
9. Big Data and Analytics, S. Acharya, S. Chellappan, Wiley Publication.
10. Introduction to Machine Learning, Jeeva Jose, Khanna Publishing House.

Operating System Lab

Course code	LC-CSE-212G			
Category	Laboratory Course			
Course title	Operating System Lab			
Scheme and Credits	L	T	P	Credits
	0	0	4	2
Branches (B. Tech.)	Computer Science and Engineering			
Class work	25 Marks			
Exam	25 Marks			
Total	50 Marks			
Duration of Exam	03 Hours			

Contents:

1. Introduction to UNIX File System.
2. File and Directory Related Commands in UNIX.
3. Essential UNIX Commands for working in UNIX environment.
4. I/O Redirection and Piping
5. Introduction to VI Editors.
6. Introduction of Processes in UNIX
7. Communication in UNIX and AWK.
8. Introduction of the concept of Shell Scripting.
9. Decision and Iterative Statements in Shell Scripting.
10. Writing the Shall Scripts for unknown problems.

Suggested Books:

1. UNIX Shell Programming by Yashavant Kanetkar.
2. UNIX Concepts and Applications by Sumitabha Das

Course Outcomes.

Co1: Understand the structure and architectural components of UNIX Operating System to analyze and design the problem. Moreover, students would be able to know the Basic Introduction of UNIX Operating System.

Co2: Basic Introduction of UNIX Commands that are used for operating the UNIX.

Co3: Introduction of Shell Scripting and VI Editor.so that the students get familiar with writing the UNIX scripts in UNIX editor.

Co4: Students will establish themselves as effective professionals by solving real problems with UNIX Shell Scripting knowledge and with attention to teamwork, critical thinking and problem solving skills by Writing Shell Scrips of unknown problems

Object Oriented Programming LAB

Course code	LC-CSE-256G				
Category	Lab Course				
Course title	Object Oriented Programming LAB				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	25Marks				
Exam	25Marks				
Total	50Marks				
Duration of Exam	03Hours				

Tentative List of Experiments:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

NOTE: More programs related to the course contents of Object Oriented Programming using Java can be designed and developed by the subject faculty.

Programming for Data Science & AIML LAB

Course code	LC-CSE-258G				
Category	Laboratory Course				
Course title	Programming for Data Science & AIML LAB				
Scheme and Credits	L	T	P	Credits	
	0	0	2	1	
Classwork	25Marks				
Exam	25Marks				
Total	50Marks				
Duration of Exam	03Hours				

Tentative List of Experiments:

1. Python program to display details about the operating system, working directory, files And directories in the current directory, lists the files and all directories, scan and classify them as directories and files
2. Python program to convert an array to an array of machine values and vice versa
3. Python program to get information about the file pertaining to the file mode and to get time values with components using local time and gm time.
4. Python program to connect to Google using socket programming
5. Python program to perform Array operations using Numpy package
6. Python program to perform Data Manipulation operations using Pandas package.
7. Python program to display multiple types of charts using Matplotlib package
8. Python program to perform File Operation on Excel Data Set
9. Python program to implement with Python Sci Kit-Learn & NLTK.
10. Python program to implement with Python NLTK/Spicy/Py NLPI.

NOTE: More programs related to the course contents of Object Programming for Data Science & AIML can be designed and developed by the subject faculty.

Database Management System Lab

Course code	LC-CSE-209G			
Category	Laboratory Course			
Course title	Database Management System Lab			
Scheme and Credits	L	T	P	Credits
	0	0	4	2
Branches (B. Tech.)	Computer Science and Engineering			
Class work	25 Marks			
Exam	25 Marks			
Total	50 Marks			
Duration of Exam	03 Hours			

Course Objectives:

- Keep abreast of current developments to continue their own professional development
- To engage themselves in lifelong learning of Database management systems theories and technologies this enables them to purse higher studies.
- To interact professionally with colleagues or clients located abroad and the ability to overcome challenges that arises from geographic distance, cultural differences, and multiple languages in the context of computing.
- Develop team spirit, effective work habits, and professional attitude in written and oral forms, towards the development of database applications.

Contents:

i. Creation of a database and writing SQL queries to retrieve information from the database.
ii. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
iii. Creation of Views, Synonyms, Sequence, Indexes, Save point.
ii. Creating an Employee database to set various constraints.
iii. Creating relationship between the databases.
iv. Study of PL/SQL block.
v. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
vi. Write a PL/SQL block that handles all types of exceptions.
vii. Creation of Procedures.
viii. Creation of database triggers and functions
ix. Mini project (Application Development using Oracle/ MySQL)
    a. Inventory Control System
    b. Material Requirement Processing.
    c. Hospital Management System.
    d. Railway Reservation System.
    e. Personal Information System.
    f. Web Based User Identification System.
    g. Time Table Management System.
    h. Hotel Management