Program Syllabus Booklet

Master of Computer Applications

(MCA-309)

Session: 2021-22

University College of Computer Applications
Guru Kashi University, Talwandi Sabo

GURU KASHI UNIVERSITY
PUNJAB - INDIA

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Annexure -1

Program Name: Master of Computer Applications (MCA)

Program Code: 301

The Program Outcomes (POs): The PO for the Master of Computer Applications (MCA) are as follows:

PO	Statement
PO1	**Computational knowledge:** To understand and apply mathematical foundation, computing knowledge for the conceptualization of computing models from defined problems.
PO2	**Problem analysis:** To ability to identify, critically analyze and formulate complex computing problems using fundamentals of computer science and application domains.
PO3	**Design/development of solutions:** To ability to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.
PO4	**Conduct investigations of complex Computing problems**: To ability to devise and conduct experiments, interpret data and provide well informed conclusions.
PO5	**Modern tool usage:** To ability to select modern computing tools, skills and techniques necessary for innovative software solutions.
PO6	**Societal & Environmental Concern:** To ability to recognize economical, environmental, social, health, legal, ethical issues involved in the use of computer technology and other consequential responsibilities relevant to professional practices.
PO7	**Environment and sustainability:** To understand the impact of the professional programmer solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** To apply ethical principles and commit to professional ethics and responsibilities and norms of the computer practice.
PO9	**Individual and team work:** To function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10	**Communication:** To communicate effectively on complex Computer activities with the Computer community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** To demonstrate knowledge and understanding of the programmer and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** To recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The Program Specific Outcomes (PSOs): The Program Specific Outcomes (PSOs) for the Program Master of Computer Applications are as follows:

PSO	Statement
PSO1	To solve real-world computing problems of various businesses by understanding principles of mathematics, computing techniques and other related disciplines to meet customer's business objectives.
PSO2	To students will be able to pursue careers in IT industry, research and development, teaching and areas related to computer science & applications.
PSO3	To analyze the societal needs to provide novel solutions through technological based research.

Annexure-2

Semester: 1st										
S.No	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	309101	Operating Systems	T	4	0	0	4	50	50	100
2	309102	Advanced Database Management System	T	4	0	0	4	50	50	100
3	309103	Data Structure & Algorithms	T	4	0	0	4	50	50	100
4	309104	Discrete Mathematics	T	4	0	0	4	50	50	100
5	309105	Human Values and Ethics	T	4	0	0	4	50	50	100
6	309106	Computer Organization and Architecture	T	4	0	0	4	50	50	100
7	309107	Data Structure using C Lab	P	0	0	6	3	60	40	100
8	309108	Advanced Database Management System Lab	P	0	0	4	2	60	40	100
Total No. of Credits				29						

Semester: 2nd										
S.No	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	309201	Computer Based Optimization Techniques	T	4	0	0	4	50	50	100
2	309202	Object Oriented Programming	T	4	0	0	4	50	50	100
3	309203	Web Designing	T	4	0	0	4	50	50	100
4	309204	Principles Of Management And Organizational Behaviour	T	4	0	0	4	50	50	100
5		**Elective-I**	T	4	0	0	4	50	50	100
6	309208	Software Engineering	T	4	0	0	4	50	50	100
7	309209	Object Oriented Programming Lab	P	0	0	4	2	60	40	100
8	309210	Web Designing Lab	P	0	0	6	3	60	40	100
Total No. of Credits				29						

Elective-I (Select one of the following subjects)		
S.No	**Subject Code**	**Subject Name**
1	309205	Data Mining
2	309206	Soft Computing
3	309207	Machine Learning

Semester: 3rd										
S.No	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	309301	Computer Graphics and Multimedia	T	4	0	0	4	50	50	100
2	309302	Data Communication & Computer Networks	T	4	0	0	4	50	50	100
3	309303	Artificial Intelligence	T	4	0	0	4	50	50	100
4	309304	Programming using Python	T	4	0	0	4	50	50	100
5	309305	Theory of Computation	T	4	0	0	4	50	50	100
6	309306	Workshop on JAVA	P	0	0	4	2	60	40	100
7		**Elective-II**	T	4	0	0	4	50	50	100
8	309310	Programming using Python Lab	P	0	0	6	3	60	40	100
Total No. of Credits				29						

Elective-II (Select one of the following subjects)		
S.No	**Subject Code**	**Subject Name**
1	309307	Cloud Computing
2	309308	Storage Area Network
3	309309	Data Analytics

Semester: 4th										
S.No	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	309401	Industrial Training/Internship (6 Months)	NA	NA	NA	NA	20	500	500	1000
Total No. of Credits				20						

Annexure-3

Course Name: Operating System

Course Code: 309101

Semester: 1st

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Get acquainted with the fundamentals of Operating System concepts.
CO2	Attain the mechanisms of OS to handle processes and threads.
CO3	Learn the role of paging, segmentation and virtual memory in operating systems.
CO4	Learn about the various Scheduling Algorithms.
CO5	Attain the knowledge about deadlock detection algorithms

Course Contents

Section A

Introductory Concepts: Operating system functions and characteristics, historical evolution of operating system, Real time system, Distributed system, Methodologies for implementation of O/S service, system calls, system programs, Interrupt mechanisms.

Processes: Process model, Process states, process hierarchies, implementation of Processes, data structures used such as Process table, PCB creation of processes, context switching, exit of Processes.

Inter-process communication: Race conditions, critical sections, problems of mutual exclusion, Peterson's solution, producer-customer problem, Reader Writer's Problem, Dining Philosophers Problem, semaphores, monitors, message passing.

Process scheduling: objective, preemptive vs. non-preemptive scheduling, comparative assessment of different algorithms such as round robin, priority bases scheduling. FCFS, SJF, multiple queues with feedback

Section B

Deadlocks: Conditions, modeling, detection and recovery, deadlock avoidance, deadlock prevention.

Memory Management: Multiprogramming with fixed partition, variable partitions, virtual memory, paging, demand paging, design and implementation issues in paging such as page tables, inverted page tables, page replacement algorithms, page fault handling, working set model, local vs. global allocation, page size, segmentation with paging.

File systems: File type, attributes, access and security, file operations, directory structures, path names, directory operations, implementation of file systems, implementation of file and file operation calls, implementation of directories, sharing of files, disk space management, block allocation, free space management, logical file system, physical file system.

Device management: Techniques for device management, dedicated devices, shared devices, virtual devices; device characteristics, hardware considerations: input & output devices, storage devices: independent device operation, buffering, multiple paths device allocation considerations.

Text Books:

1. Peterson, J.L. & Silberschatz (2010) A. *Operating System Concepts*, 2nd Addison Wesley, New Delhi.
2. Tanenbaum, A.S. (2002) *Operating System*, 3rd, PHI, New Delhi.

Reference Books:

1. Hansen Brinch (2000) *Operating System Principles,* 3rd, PHI, New Delhi.
2. Willams Stalling, *Operating System*, 7th, PHI, Delhi.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	1	2	2	3	3	3	2	1
CO2	2	3	2	2	3	1	-	1	3	3	2	3	1	3	2
CO3	2	-	2	2	3	1	1	-	3	3	3	3	2	1	2
CO4	3	3	3	3	2	2	-	1	3	2	2	2	3	1	3
CO5	3	-	2	-	3	2	1	-	2	3	2	2	1	2	1
Average	**2.6**	**2.6**	**2.2**	**2.2**	**2.8**	**1.6**	**1.3**	**1**	**2.6**	**2.6**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Database Management System

Course Code: 309102

Semester: 1st

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Interpret the basic concepts and explore the applications of database systems.
CO2	Understand the basics of SQL and construct queries using SQL.
CO3	Make familiar with a commercial relational database system (Oracle) by writing SQL using the system.
CO4	Get knowledge of the relational database theory, and be able to write relational algebra expressions for queries.
CO5	Grasp the design principles for logical design of databases, including the E-R method and normalization approach.

Course Contents

Section A

Introduction: Overview of Database Management System: Various views of data Models, Schemes and Introduction to database Languages & Environments, Advantages of DBMS over file processing systems, Responsibility of Database Administrator. Three level architecture of Database Systems. Data Models: E-R Diagram (Entity Relationship), mapping Constraints, keys, Reduction of E-R diagram into tables.

Normalization: Integrity constrains, functional dependencies & Normalization, 1st, 2nd, 3rd and BCNF.

Network, Hierarchical and Relational Data Models: Network Models, Hierarchical Models, Relational Models, Relational Algebra & various operations (set operations, select, project, join, division), Order.

Section B

Security and Recovery in Database: Database protection: Recovery, concurrency, security, integrity and control

Parallel and Distributed Databases and Client-Server Architecture: Architecture for parallel database; Distributed database concepts, Data fragmentation, Replication, and allocation techniques, Overview of Client-Server Architecture.

Enhanced Data Models for Advanced Applications: Active database concepts, Temporal database concepts, Spatial databases, Deductive databases; Emerging Database Technologies: Mobile databases, Multimedia Databases

SQL: Introduction and Basic commands of SQL.

Text Books:

1. Elmasri Ramez, Navathe Shamkant B (2007).*Fundamentals of Database Systems*, 5th Edition, Pearson Education, New Delhi.
2. Date C.J. (2002). *An Introduction to Database Systems*, 7th Edition, Pearson Education, and New Delhi.
3. Silberschatz A, Korth H.F Sudarshan S (1997).*Database System Concept*, 3rd Edition, Mc Graw-Hill, International Edition.

Reference Books:

1. Hansen G.W (1999). *Database Management and Design,* 2nd Edition. Prentice-Hall of India, New Delhi.
2. Majumdar A, K, Bhattacharyya P (2007). *Database Management Systems*, 5th Edition. Tata McGraw-Hill Publishing Company, New Delhi.
3. Data, C. and Darwen, H. (2003). *A Guide to the SQL Standard,* 3rd Edition. Addison-Wesley Publications, New Delhi.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	1	-	1	3	3	3	3	2	3	1
CO2	2	2	3	2	2	-	1	1	3	2	3	3	1	2	3
CO3	1	2	3	2	3	-	1	-	2	2	2	2	3	1	2
CO4	2	2	3	1	2	1	2	-	3	3	3	3	1	3	1
CO5	2	1	3	1	3	1	1	1	1	1	2	1	3	2	2
Average	**2**	**1.8**	**3**	**1.6**	**2.6**	**1**	**1.2**	**1**	**2.4**	**2.2**	**2.6**	**2.4**	**2**	**2.2**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Structure & Algorithms

Course Code: -309103

Semester: 1st

Credits -04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Understands and restates the fundamentals of basic data structures.
CO2	Implements basic algorithms for sorting and searching.
CO3	Learn the details of stack, queue and linked list operation.
CO4	Interpret knowledge of tree and graphs concepts.
CO5	Apply algorithms and data structures in various real-life software problems.

Course Contents

Section A

Introduction to Data Structures & Algorithms Introduction of Data structures, Abstract Data Types, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations (Big O, Omega, Theta), Performance measurement, Divide and Conquer, Back Tracking Method, Dynamic programming

Sorting and searching algorithms Bubble sort, Insertion sort, Radix Sort, Quick sort, Merge sort, Heap sort, Selection sort, shell Sort, Linear Search, Sequential search, Binary search

Hashing Different Hashing Techniques, Address calculation Techniques, Common hashing functions, Collision resolution techniques: Linear probe, Quadratic probe, Key offset. Rehashing, Double hashing, Link list addressing.

Section B

Linear Data Structures Stack Definition, Operations, Implementation of Stacks (Array and Linked list) and applications-Evaluation of postfix expression, Balancing of parenthesis Queue: Definition, Operations, Implementation of simple queue (Array and Linked list) and applications of queue-BFS Types of queues: Circular, Double ended, Priority, Implementation using linked list Types of Linked List: Singly, Doubly and Circular Linked list Definition, Operations (Insert, delete, traverse, count, search)

Non-linear Data Structures Tree Definition and concepts, General Tree- Definition, Insertion and Deletion into general tree, Binary Tree- Definition, Insertion and Deletion into binary tree, Traversal of a binary tree, Reconstruction of a binary tree from traversal, Conversion of general tree into binary tree, Huffman tree, Expression tree, Binary threaded three Binary Search Tree- Definition, Operation, Implementation AVL tree- Definition, AVL tree rotation with examples, Heaps-Definition, Operations (insertion, delete, build) M way Tree- Introduction, B tree-definition and examples and B * 14

Graphs Definition, Types, Operations, Representation, Networks, Traversals of graph, Minimum spanning tree, Kruskal's Algorithm, Prim's Algorithm, Warshall's Algorithm, Shortest path algorithm-Dijsktra's algorithm

References:

1. A. Tannenbaum, Y. Lanhgsam and A.J.Augenstein (1990). *Data Structures Using C*, Prentice Hall of India.
2. Seymour Lipschultz (1988) *Theory and Practice of Data structures*. McGraw Hill.
3. E. Horowitz and S.Sahni, (1991) *Data structures with Pascal*, Galgotia, 3rd edition.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	1	3	1	1	1	3	3	1	3	1	3	2
CO2	3	3	3	1	3	2	1	1	3	2	2	3	2	1	3
CO3	1	2	3	3	3	3	-	-	3	2	1	2	3	2	1
CO4	2	2	3	3	3	-	1	-	2	1	1	2	2	3	2
CO5	2	1	2	2	2	-	1	1	1	1	2	2	1	2	1
Average	**2**	**2**	**2.8**	**2**	**2.8**	**2**	**1**	**1**	**2.4**	**1.8**	**1.4**	**2.4**	**1.8**	**2.2**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Discrete Mathematics

Course Code: 309104

Semester: 1st

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Attain all the basic principles of sets and operations in sets.
CO2	Write an argument using logical notation and determine if the argument is or is not valid.
CO3	Get knowledge about all counting principles to determine probabilities.
CO4	Solve various methods of Recurrence relations.
CO5	Learn about the various traversal methods for trees and graphs.

Course Contents

Section A

Set Theory: Introduction to set theory, Set operations, Algebra of sets, combination of sets, Duality, Finite and Infinite sets, Classes of sets, Power Sets, Multi sets, Cartesian Product.

Relations and Functions : Representation of relations, Types of relation, Binary Relations, Equivalence relations and partitions, Partial ordering relations and lattices, Mathematics Induction, Principle of Inclusion & Exclusion. Function and its types, Composition of function and relations, Cardinality and inverse relations. Functions & Pigeonhole principle.

Propositional Calculus: Basic operations: AND (^), OR (v), NOT (~), Truth value of a compound statement, propositions, tautologies, contradictions.

Recursion And Recurrence Relation: Sequences, Introduction to AP and GP series, partial fractions, linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

Combinatorial Mathematics: Techniques of counting: Rule of sum, Rule of product. Permutations & Combinations.

Section B

Algebraic Structures: Definition, elementary properties of algebraic structures, Basic

algebraic structures: Semi group, monoid, group, subsemigoup, submonoid, subsemigroup. Congruence relations. Homomorphism, Isomorphism and Automorphism, Subgroups and Normal subgroups, Cosets, Lagrange‟s theorem, cyclic groups. Rings, Types of rings, division rings, Integral domains and fields

Graph Theory: Introduction to graphs , Directed and undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits. Planar graphs, Euler‟s formula.

Trees: Introduction to trees, Difference between a graph and a tree, Rooted Trees, Path length in trees, Spanning Trees & cut-sets, Minimum cost spanning trees, Binary trees and its traversal.

Text Books:

1. Liu C.L, *Elements of Discrete Mathematics*, Mc Graw Hill.
2. Santha, *Discrete Mathematics with Graph Theory*, Cengage Learning.
3. Ronald G, Knuth, Donald and Patashik, Oren, Concrete *Mathematics: A Foundation for Computer Science.* Addison-Wesley.

Reference Books:

1. Kolman, B. and Busby ,R.C, *Discrete Mathematical Structures*, PHI.
2. Gersting, Judith L. *Mathematical Structures for Computer Science.* Computer Science Press.
3. Doerr and Levasseur, *Applied Discrete Structures for Computer Science.*
4. Tembley & Manohar, *Discrete Mathematical Structures with Applications to Computers.* Mc Graw Hill.
5. Rosen K. H, *Discrete Mathematics and its applications*, Mc-Grawhill.
6. Lyengar, N Ch SN, Chandrasekaran, VM. *Discrete Mathematics.*

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	1	1	2	3	1	2	2	3	2	1
CO2	1	3	3	1	1	1	1	-	2	2	1	2	1	3	2
CO3	2	2	3	2	2	1	1	1	2	2	2	2	2	1	2
CO4	2	2	3	3	2	1	-	1	3	2	2	3	3	1	3
CO5	2	2	3	2	2	-	1	2	2	2	3	3	1	2	1
Average	**1.8**	**2.2**	**2.8**	**2**	**1.6**	**1**	**1**	**1.5**	**2.4**	**1.8**	**2**	**2.4**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Human Values and Ethics

Course Code: 309105

Semester: 1st

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Discuss the core values that shape the ethical behavior of an engineer.
CO2	Attain the awareness on professional ethics and human values.
CO3	Inculcate ethics and human values into the young minds.
CO4	Develop moral responsibility and mould them as best professionals.
CO5	Create ethical vision and achieve harmony in life.

Course Contents

Section A

Human Values: Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Co-operation - Commitment - Empathy - Self-Confidence - Character – Spirituality.

Section B

Engineering Ethics: Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - Self-interest - customs and religion - Learning from past.

Section C

Laws and Rights: Basic laws of India, codes of ethics, case studies of typical holistic technologies, - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) – discrimination, Environmental ethics.

Section D

Safety and Responsibilities: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk. Collegiality and loyalty - respect for authority - collective

Bargaining - confidentiality.

Text Books:

1. Martin Mike and Schinzinger Roland, (1996) *Ethics in Engineering.* McGraw-Hill, New York.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, (2004) *Engineering Ethics* .Prentice Hall of India, New Delhi .
3. A. Alavudeen, R. kapilRahman, M. Jaya Kumar, *Professional Ethics and Human Values.*

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	2	3	3	3	3	3	3	3	1	3	2
CO2	2	2	1	1	-	3	3	3	3	3	1	3	3	2	1
CO3	1	2	3	-	1	2	2	3	3	2	-	2	2	1	2
CO4	3	1	1	1	1	2	2	3	2	2	2	3	1	2	1
CO5	2	1	3	2	1	3	2	2	1	2	1	2	2	1	3
Average	**1.8**	**1.4**	**2**	**1.2**	**1.2**	**2.6**	**2.4**	**2.8**	**2.4**	**2.4**	**1.7**	**2.6**	**1.8**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Organization and Architecture

Course Code: 309106

Semester: 1st

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Classify the architecture of central processing unit.
CO2	Understand the concepts of register transfer logic and arithmetic operations.
CO3	Access and organize various types of Memories and mapping process.
CO4	Memorize the microprocessor architecture and assembly language programming.
CO5	Learn the concepts in digital logic design, logic elements and their use in combinational and sequential logic circuit design.

Course Contents

Section A

Number System: Number conversions, Arithmetical operations, Concepts about bits, bytes and word.

Representation of Information: Integer and floating point representation, Complement schemes, Character codes (ASCII, EBCDIC, BCD, 8421, 2421, Excess-3, Grey, Hamming, Parity). Basic Building blocks: Boolean Algebra, K-maps.

Combinational logic design: half-adder/subtractor, full adder/subtractor, parallel adder, Multiplexers, Demultiplexers, Decoders, Encoders.

Sequential circuits- concept, flip-flops (RS, D, JK, JK-Master-Slave, T), counters (Asynchronous, Synchronous) Mod-3, Mod-5, Decade Counter.

Computer organisation: Structure of Computer, Instruction codes, Instruction formats, Instruction cycle, Addressing modes

Section B

Register Transfer Language, Arithmetic, Logic and Shift micro-operations,

Control Memory: Design of control unit, Micro program Sequencer, Micro programmed and hardwired control unit (overview only), Features of RISC and CISC.

Memory organisation: Concepts of semiconductor memory, CPU- memory interaction,

organization of memory modules, Cache memory and related mapping and replacement policies, Virtual memory

I/O organisation: I/O interface, Modes of data transfer: Programmed - initiated, Interrupt initiated, DMA, I/O controllers

Architecture of 8085, Assembly language programming of 8085 machine.

Text Books:

1. D. P. Leach, A. P. Malvino, (2002) *Digital principles & applications*, Tata McGraw-Hill Edition.
2. William Stallings, (2002) *Computer Organisation and Architecture*, 6th edition, Pearson Education.
3. A.S.Tannenbaum, (1999) *Structured Computer Organisation*, Prentice- Hall of India.

Reference Books:

1. Jyotsna Sengupta, (2009) Fundamentals of Computer Organization and Architecture. NuTech Books, Deep and Deep Publications, New Delhi.
2. M.M. Mano, (2002) *Computer System Architecture*, Third Edition, Prentice-Hall of India, 2002.
3. Vincent.P.Heuring, Harry.F.Jordan, (2000) *Computer Systems Design and Architecture* .Addison Wesley.
4. Nicholas Carter,(2002) *Schaum's Outlines Computer Architecture*. Tata McGraw Hill.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2	-	-	1	2	3	2	2	3	2	1
CO2	3	2	2	2	1	-	-	1	3	2	2	2	1	3	2
CO3	2	1	2	1	1	1	2	2	1	2	2	2	2	1	2
CO4	3	2	2	2	2	-	1	2	2	3	3	3	3	1	3
CO5	3	2	2	2	2	1	1	1	2	3	3	3	1	2	1
Average	**2.4**	**1.8**	**2.2**	**1.8**	**1.6**	**1**	**1.3**	**1.4**	**2**	**2.6**	**2.4**	**2.4**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Structure using C Lab

Course Code: 309107

Semester: 1st

Credits: 03 **L T P**

0 0 6

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Gain knowledge about the applications of data structures.
CO2	Solve Algorithmic problems like insertion and deletion of data
CO3	Write the programming code to implement the Link List Structure.
CO4	Analyze Singly, Doubly, Circular Singly linked lists and its operations.
CO5	Implement the insertion and deletion on BST and heap sort

Course Contents

Programs 1. Program to input 1-D Array

Programs 2. Program to perform insertion in Arrays

Programs 3. Program to perform deletion in Arrays

Programs 4. Program to input 2-D arrays (Matrices)

Programs 5.Program to find transpose of a matrix. Multiply 2 matrices.

Programs 6.Program to implement sparse matrices.

Programs 7. Program to perform Linear search

Programs 8. Program to perform Binary search

Programs 9.Program to reverse array without using another variables.

Programs 10.Program to perform Bubble sort.

Programs 11. Program to perform sorting using Selection Sort.

Programs 12. Program to perform sorting using Insertion Sort.

Programs 13.Program to input and traverse N-nodes in a one way linked list.

Programs 14. Program to reverse a one way linked list.

Programs 15. Program to perform insertion/deletion in linked lists.

Programs 16. Program to input and traverse doubly linked list.

Programs 17.Program to implement stack operations.

Programs 18.Program to implement Queues.

Programs 19.Program to find factorial using recursion.

Programs 20.Program to print Fibonacci series using recursion.

Programs 21.Program to input a BST.

Programs 22.Program to perform insertion in a BST.

Programs 23.Program to perform deletion in a BST.

Programs 24.Program to implement min-heaps.

Programs 25.Program to implement max-heaps.

Programs 26.Program to implement AVL trees.

Programs 27.Program to perform rotations in AVL trees.

Programs 28.Program to perform rotations in AVL trees.

Programs 29.Program to input a graph.

Programs 30.Program to print adjacency list of a graph.

Programs 31.Program to perform traversal in graphs using DFS.

Programs 32.Program to perform traversal in graphs using BFS.

Programs 33.Program to implement shortest path methods.

Programs 34.Programs to perform Dynamic memory allocation.

Programs 35. Programs to perform sorting on data stored in a file.

Programs 36. Programs to delete duplicates In arrays and linked lists.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	1	-	1	2	2	2	2	1	2	3
CO2	3	3	2	1	2	-	-	1	2	2	2	2	3	1	2
CO3	2	2	2	2	1	2	-	1	2	3	3	3	2	3	3
CO4	2	3	3	3	1	1	2	-	3	2	3	3	3	2	3
CO5	2	2	3	3	1	1	1	1	2	2	2	2	2	3	2
Average	**2.2**	**2.4**	**2.4**	**2.2**	**1.2**	**1.2**	**1.5**	**1**	**2.2**	**2.2**	**2.4**	**2.4**	**2.2**	**2.2**	**2.6**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Advanced Database Management System Lab

Course Code: 309108

Semester: 1st

Credits: 02 **L T P**

0 0 4

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Apply the basic concepts of Database Systems and its Applications.
CO2	Design and implement a database schema for a given problem-domain
CO3	Apply queries using SQL in database creation and interaction.
CO4	Perform various types of SQL queries to retrieve data from multiple tables.
CO5	Analyze recovery techniques of database system.

Course Contents

Section A

1) Data Definition Language Commands
2) Data Manipulation Language Commands
3) Data Control Language, Transfer Control Language Commands
4) In Built Functions
5) Nested Queries And Join Queries
6) Set operators
7) Views
8) Control Structure
9) Procedure and Function
10) Trigger
11) Front End Tools
12) Form
13) Menu Design
14) Report Generation
15) Database Design And Implementation Payroll Processing

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	-	1	-	1	1	2	2	3	2	1
CO2	3	3	3	2	1	1	2	1	1	1	2	2	1	3	2
CO3	2	2	3	1	1	-	1	-	-	-	1	2	2	1	2
CO4	2	2	2	2	1	-	-	1	1	1	1	1	3	1	3
CO5	2	2	2	2	2	-	2	1	1	1	2	2	1	2	1
Average	**2.2**	**2.2**	**2.4**	**1.8**	**1.2**	**1**	**1.5**	**1**	**1**	**1**	**1.6**	**1.8**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Based Optimization Techniques

Course Code: 309201

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Learn the mathematical, engineering, and modeling skills that are the basis for computer based optimization techniques.
CO2	Understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
CO3	Apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.
CO4	Solve Probability and Uncertainty problems.
CO5	Analyze Decision Tree using various method such as Integer programming and Branch & Bound method.

Course Contents

Section A

Origin & development of O.R., Nature & Characteristic features of O.R., Models & Modeling in Operation research. Methodology of O.R., general methods for solving O.R. & decision making, application, use & limitations of O.R. Linear Programming formulation, graphical & simplex method, duality in L.P. Transportation Problems: Loops, Test For Optimality, Degeneracy In Transpiration Problems. Unbalanced Transportation Problems. Transmanship Problems, Assignment & Routing Problems, Travelling Salesman Problem.

Section B

Probability & Uncertainty, Sample Space & Probability, Algebra of Events, Conditional Probability. Decision Making: Decision Making, Environment, Decision under Uncertainty, Decision under Risk, Decision Tree Analysis. Revised Simplex Method, Integer Programming, Branch & Bound Method, Dynamic Programming.

References:

1. Swarup Kanti, Gupta P.K, Manmohan, (1994) *Operation Research*, Sultan Chand & Sons Seventh Ed.
2. Sharma S.D, (1992) *Operation Research*, Kedar Nath Ram Nath And Co. Meerut, Tenth Ed.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	2	1	1	1	2	2	1	2	2	1	3
CO2	2	2	1	2	1	-	-	1	1	1	2	2	3	2	2
CO3	1	3	3	2	1	-	1	-	2	2	2	2	2	3	1
CO4	2	2	2	2	1	-	-	-	1	1	1	1	3	2	3
CO5	1	2	1	3	1	-	-	1	1	2	2	2	2	1	2
Average	**1.6**	**2.2**	**1.8**	**2.4**	**1.2**	**1**	**1**	**1**	**1.4**	**1.6**	**1.6**	**1.8**	**2.4**	**1.8**	**2.2**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Object Oriented Programming

Course Code: 309202

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Get acquainted with all the basic concepts of C++ and its features such as composition of objects, Operator overloading.
CO2	Analyze the various access modifiers in C++ programs.
CO3	Analyze inheritance with the understanding of early binding and late binding.
CO4	Use various object oriented concepts to solve different problems.
CO5	Analyze and explore various Stream classes, I/O operations and exception handling.

Course Contents

Section A

Programming Basics- Introduction to Programming, Programming Paradigms, Programming Languages and Types. Introduction to C - Basic Program Structure, Execution flow of C Program, Directives, Basic Input /Output Introduction to Object Oriented Programming- OOP concepts, Advantages, Applications, Comparison of C and C++-Data Types, Control Structures, Operators and Expressions

Introduction to C++ Structure of a C++ program, Execution flow, Classes and Objects, Access modifiers, Data Members, Member Functions, Inline Functions, Passing parameters to a Function(pass by Value, Pass by Address, Pass by Reference), Function with default arguments, Function Overloading, Object as a Parameter, Returning Object Static data members and functions, Constant Data members and functions Constructors- Default, Parameterized, Copy, Constructor Overloading, Destructors Arrays, Array as a Class Member, Array of Objects, Strings C style strings and String Class

Operator Overloading and Pointers Operator Functions-Member and Non Member Functions, Friend Functions Overloading Unary operators Overloading binary operators(Arithmetic, Relational, Arithmetic Assignment, equality), Overloading Subscript operator Type Conversion Operators- primitive to Object, Object to primitive, Object to

Object Disadvantages of operator Overloading, Explicit and Mutable Pointers, Pointer and Address of Operator, Pointer to an Array and Array of Pointers, Pointer arithmetic, Pointer to a Constant and Constant Pointer, Pointer Initialization, Types of Pointers(void, null and dangling), Dynamic Memory Allocation, Advantages and Applications of pointers

Section B

Inheritance and Polymorphism Inheritance Concept, Protected modifier, Derivation of Inheritance- Public, Private and Protected, Types of Inheritance-Simple, Multilevel, Hierarchical, Multiple, Hybrid, Constructors and Inheritance, Function Overriding and Member hiding Multiple Inheritance, Multipath inheritance – Ambiguities and solutions Polymorphism, Static and Dynamic Binding, Virtual Functions, Pure Virtual Functions, Virtual destructors, Abstract Classes, Interfaces

Streams and Exceptions - Files, Text and Binary Files, Stream Classes, File IO using Stream classes, File pointers, Error Streams, Random File Access, Manipulators, Overloading Insertion and extraction operators Error handling, Exceptions, Throwing and catching exceptions, Custom Exceptions, Built in exceptions

Advanced C++ Casting- Static casts, Const Casts, Dynamic Casts, and Reinterpret Casts. Creating Libraries and header files. Namespaces Generic Programming, Templates, Class Templates, Function Templates, Template arguments, STL Database Programming with MySQL

Text Books:

1. Lafore Robert, (2015) *Object Oriented Programming in Turbo C+ +*, 1st. Pearson Education, New Delhi.
2. Kamthane (2013) *Object Oriented Programming Using C++*, 2nd. Pearson Education, New Delhi.
3. Salaria R.S(2006) *Mastering object Oriented Programming with C++ 3rd*, Salaria Publishing House.

Reference Books:

1. Deitel H M, Deitel P J, *C + + How to Program*. Prentice Hall, India, New Delhi.
2. Schildt Herbert, *The Complete Reference in C++*.TMH, New Delhi.
3. Ravichandran D, *Programming with C++ TMH*, New Delhi.
4. Balagurusamy E, *Object Oriented Programming with C++*, Tata McGraw- Hill, New Delhi.
5. Horstmann, *Computing Concept with C++ Essentials*. John wiley, New Delhi.
6. Easttom Chuck, *C++ Programming Fundamentals*. Firewall Media.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	1	1	1	2	2	1	3	2
CO2	2	2	2	2	1	-	-	1	1	2	3	3	3	2	1
CO3	2	2	2	2	1	1	1	-	2	2	2	2	2	1	3
CO4	2	2	2	1	1	-	-	1	2	2	2	2	1	3	2
CO5	2	2	2	3	1	-	1	1	1	1	2	2	3	2	3
Average	**2.2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1.4**	**1.6**	**2.2**	**2.2**	**2**	**2.2**	**2.2**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Web Designing

Course Code: 309203

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Learn the language of web: HTML/CSS.
CO2	Understand the principles of creating an effective web page
CO3	Summarize managing web page styles using java script and CSS.
CO4	Understand how the HTML, CSS and JavaScript components of Bootstrap work
CO5	Develop a fully functioning website and deploy on a web server.

Course Contents

Section A

Introduction HTML Documents, various Tags, Text Elements, Tag Elements, Special Character elements Structural elements of HTML documents: Header tags, Body tags, Paragraphs, Titles, Numbered list, Non, Numbered lists, Definition lists, Formatting HTML Documents

Managing images in Html: Image format (quality, size, type), Importing images (scanners), Tags used to insert images, Frames, Tables in HTML, Internal Links, External Links, Link Tags, Links with images and buttons, Links that send email messages Text fonts, Sensitive Images, Tip tables, Page

Cascading Style Sheets: ways of inserting a style sheet:

- External style sheet
- Internal style sheet
- Inline style

CSS Id and Class, Inheritance in CSS

Section B

Bootstrap: Introduction to Bootstrap, Bootstrap 3 vs. Bootstrap 4 , Setting up Environment , Bootstrap 4 Basic Template, Containers, container-fluid, Container Padding , Grid Classes , Display Headings, More Typography Classes , Text Colors, Carousel, Cards, Buttons, Button group, Nav bar , Tooltip

JavaScript Introduction: JavaScript Syntax, JavaScript Variables, JavaScript Data Types, JavaScript Operators, JavaScript Comments, JavaScript if else and else if , Loop ,JavaScript Functions, JavaScript Events, Arrow Function

JavaScript HTML DOM: JavaScript HTML DOM methods, Finding HTML Elements, Changing HTML Elements, Adding and Deleting Elements, Changing the Value of an Attribute, Changing CSS, DOM Event Listener, Add an Event Handler to an Element JSON, Exchanging Data, Sending Data, Receiving Data, Storing Data

References:

1. Surfas Mark, Brown Mark and Juge John, *Special Edition Using Intranet HTML***.**
2. Douyer Jef , *Dynamic HTML Web Magic*, Hayden development group.
3. Castro Elizabeth, *HTML 4 for the World Wide Web*.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	1	1	1	1	1	2	2	3	2	3
CO2	2	2	2	2	2	1	1	1	1	1	2	2	2	3	1
CO3	3	3	3	3	1	1	-	1	2	2	2	2	2	1	2
CO4	2	3	3	2	2	-	-	-	2	2	2	2	3	2	3
CO5	3	2	3	2	2	-	-	2	3	2	3	3	1	3	2
Average	**2.4**	**2.4**	**2.6**	**2.2**	**1.6**	**1**	**1**	**1.2**	**1.8**	**1.6**	**2.2**	**2.2**	**2.2**	**2.2**	**2**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Principles of Management and Organizational Behavior

Course Code: 309204

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Apply the processes of constructing the different types of information systems.
CO2	Classify the concepts related to Business Applications
CO3	Design and Develop Information Systems in real world business environment.
CO4	Implement the principles and tools of systems analysis and design.
CO5	Formulate and exercise the applications of computing era.

Course Contents

Section A

Management: The need, scope Meaning and Definition, The process of Management, Managerial levels/Hierarchy. Managerial functions: Planning Organizing, Staffing Directing, Controlling, Managerial skills: Technical, Conceptual, Human Resource Types of managers: Functional, Specialize, Generalize. Line and staff managers

Evolution of Management Thought: Historical perspective, Classical Theories: Taylor, Fayol. Behavioral: HR Approach, Behavioral Science and Approach. Management Science Approach, System approach-with reference to management, organization and MIS Contingency approach

Managerial Decision Making: Introduction, Decision making environment: open Systems, Closed system, Decision making under certainty, Decision making under uncertainty, Decision making under risk. Decision Types /models: Structured decisions, Unstructured decisions, Programmable decisions Non programmable Decisions, Classical Model Administrative model. Decision making tools: Autocratic, Participative and Consultative. Decision Making Tools: Herbert Simson's Model Principle of Rationality / Bounded Rationality

Section B

Organization: Introduction, Need for Organization. Process of Organizing. Organizational structure: Functional organization, Product Organization, Territorial Organization

Organizational Behavior: Definition / Concepts. Need /importance/ relevance

Individual Behavior and Understanding Self Ego State Transactional Analysis Johari Window

Group and Group Dynamics, Team Building, Leadership, Conflict Management

Reference:

1. Shejwalkar, *Principles and Practices of Management.*
2. Koontz H &Weitrich H, Essential of management.
3. Burton & Thakur, Management Today Principles and Practices.
4. Donnelly, Mgmt. *Principles and Functions Ivancevich & Gibson.*
5. Stepheb Robbins, *Organizational behavior.*
6. Keith Davis, *Organizational behavior.*
7. Fred Luthans, *Organizational behavior.*
8. Dr.Ashwatthap, *Organizational behavior.*

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	-	-	1	2	2	2	2	3	2	1
CO2	2	2	2	2	2	-	-	1	2	2	3	3	2	3	2
CO3	2	3	3	2	1	-	-	2	2	2	2	2	1	2	2
CO4	2	2	3	2	-	3	2	2	3	2	2	2	2	3	3
CO5	2	3	2	3	2	3	2	2	2	2	2	2	3	2	1
Average	**2.2**	**2.6**	**2.6**	**2.2**	**1.2**	**3**	**2**	**1.6**	**2.2**	**2**	**2.2**	**2.2**	**2.2**	**2.4**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Mining

Course Code: 309205

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Understand the functionality of various Data mining technique.
CO2	Familiarize with the process of data analysis, identifying the problems and choosing the relevant models and algorithms to apply.
CO3	Apply the Association rules of Data Mining.
CO4	Interpret the various Classification & Prediction Data Mining Techniques.
CO5	Learn to evaluate different clustering methods.

Course Contents

Section A

Introduction to data mining Data mining primitives, Techniques: - Clustering, classification, association rules, linear and multiple regression, Feature selection, Mining and text databases, multimedia databases, data preprocessing: data summarization, data cleaning ,data reduction. Text Mining, Mining Spatial ,Data Mining Application.

Mining Frequent Pattern: Basic concept, market basket analysis ,frequent pattern mining, frequent itemset mining methods, mining frequent itemset using candidate generation, mining frequent itemset without candidate generation methods, mining various kind of association rules.

Section B

Classification Issues regarding classification and prediction, Decision tree classifier, baysian classification, rule based classification, neural network classification, back propagation.

KNN classifier, classifier accuracy, Support Vector Machines, introduction to other classification methods like genetic algorithm, rough set approach.

Clustering What is cluster analysis, types of cluster analysis ,a categorization of major clustering method ,partition, hierarchical ,density based, grid based method, outlier analysis

Text Books:

1. Dunham Margaret H(2002), *Data Mining: Introductory and Advanced Topics.*
2. Han Jiawei, Kamber Micheline (2006), *Data Mining:Concepts and Techniques***,** 2nd ed.
3. Morgan Kaufmann, 2006.
4. Pujari Arun, (2001) *Data Mining Techniques*, University Press,
5. Hand D, Mannila H. and SmythP, (2006) *Principles of Data Mining*, Prentice-Hall of India.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	1	1	1	2	2	3	3	3	2	1
CO2	2	2	3	2	1	2	2	-	3	2	2	3	1	3	2
CO3	3	3	2	3	3	2	-	1	2	3	2	2	2	1	2
CO4	2	2	3	3	3	2	-	2	3	2	2	2	3	1	3
CO5	3	2	1	2	3	2	2	-	2	2	2	3	1	2	1
Average	**2.6**	**2.4**	**2.2**	**2.4**	**2.6**	**1.8**	**1.6**	**1.3**	**2.4**	**2.2**	**2.2**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Name: Soft Computing

Course Code: 309206

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Learn about soft computing techniques and their applications.
CO2	Analyze various neural network architectures.
CO3	Understand the concept of Perceptron and counter propagation networks.
CO4	Get knowledge about the fuzzy system.
CO5	Analyze the genetic algorithms and their applications.

Course Contents

Section A

Neural Networks

Introduction to neural networks, working of an artificial neuron, linear seperability, perceptron, perceptron training algorithm, back propagation algorithm, adalines and madalines.

Supervised and unsupervised learning, counter-propagation networks, adaptive resonance theory, neocognitron and bidirectional associative memory.

Section B

Fuzzy Logic

Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy graphs, fuzzy arithmetic and fuzzy if-then rules.Applications of fuzzy logic, neuro-fuzzy systems.

Probabilistic Reasoning

Introduction to probability theory, conditional probability, Baye's theorem, fuzzy logic and its relationship with probability theory.

References:

1. Mehrotra Kishan, Chilkuri K. Mohan and Ranka Sanjay, (2007) *Elements of artificial neural networks.*
2. Hassoun Mohammad H, (2007) *Fundamentals of artificial neural networks*, Prentice Hall of India.
3. Kosko Bart, (2007) *Neural networks and fuzzy systems*, Prentice Hall of India, Edition.
4. Yen John and Langarim Reza, (2007) *Fuzzy logic, intelligence, control and information*, Pearson Education.
5. Spiegel Murray R., Schiller John and Alu Srinivasan R,(2007)*Probability and statistics, Schaum's Outlines*, Tata McGraw Hill Publishing Company Limited.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	2	1	2	2	2	3	3	3	2	1
CO2	3	3	3	2	3	2	1	1	3	2	3	3	1	3	2
CO3	2	2	2	2	2	2	1	1	2	2	2	3	2	1	2
CO4	3	2	3	3	2	2	-	1	3	2	3	3	3	1	3
CO5	2	2	2	3	2	2	-	-	1	1	2	3	1	2	1
Average	**2.6**	**2.2**	**2.6**	**2.4**	**2.2**	**2**	**1**	**1.2**	**2.2**	**1.8**	**2.6**	**3**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Machine Learning

Course Code: 309207

Semester: 2nd

Credits: 04 **L T P**

4 0 0

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Learn about the basic concepts of Bayesian Decision Theory.
CO2	Understand the Machine Intelligence and its applications.
CO3	Study the conditional probability distributions.
CO4	Get knowledge about the working of Perceptron learning algorithm, criterion and Widrow-Hoff learning algorithm
CO5	Depict the algorithms like Nearest Neighbor classification, K-nearest neighbor and their applications.

Course Contents

Section A

Overview and Introduction to Bayes Decision Theory:

Machine intelligence and applications, pattern recognition concepts classification, regression, feature selection, supervised learning class conditional probability distributions, Examples of classifiers bayes optimal classifier and error, learning classification approaches.

Linear machines:

General and linear discriminates, decision regions, single layer neural network, linear separability, general gradient descent, perceptron learning algorithm, mean square criterion and widrow-Hoff learning algorithm; multi-Layer perceptrons: two-layers universal approximators, back propagation learning, on-line, off-line error surface, important parameters.

Section B

Learning decision trees: Inference model, general domains, symbolic decision trees, consistency, learning trees from training examples entropy, mutual information, ID3

algorithm criterion, C4.5 algorithm continuous test nodes, confidence, pruning, learning with incomplete data

Instance-based Learning: Nearest neighbour classification, k-nearest neighbour, nearest neighbour error probability,

Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam's razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoffs.

Text Books

1. Alpaydin E**,** (2006) *Introduction to Machine Learning,* Prentice Hall of India.
2. Mitchell T. M, (1997) *Machine Learning,* McGraw-Hill.
3. Bishop C. M, (2006) *Pattern Recognition and Machine Learning,* Springer.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	1	1	1	2	3	2	2	3	2	1
CO2	3	3	3	2	2	2	1	1	2	2	3	3	1	3	2
CO3	2	2	2	1	1	2	1	1	2	2	2	3	2	1	2
CO4	3	2	2	2	3	2	-	-	2	2	3	3	3	1	3
CO5	3	3	3	2	3	2	1	1	3	2	3	3	1	2	1
Average	**2.6**	**2.4**	**2.2**	**1.8**	**2.2**	**1.4**	**1**	**1**	**2.2**	**2.2**	**2.6**	**2.8**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Software Engineering

Course Code: 309208

Semester: 2nd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Understand the fundamental concepts of software model, design and testing.
CO2	Review techniques for the software lifecycle.
CO3	Perform various testing techniques.
CO4	Get knowledge about Software Requirement Analysis (SRS).
CO5	Gain knowledge about DFDs, Entity Relationship diagrams etc.

Course Contents

Section A

Introduction: Programs vs. software products, emergence of software engineering, software life cycle, models; waterfall, prototype, evolutionary and spiral model, Software Characteristics, Applications, Software crisis.

Software project management: Project management concepts, software process and project metrics Project planning, project size estimation metrics, Empirical estimation techniques, COCOMO, A Heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management, project scheduling and tracking.

Requirement Analysis and specification: Requirements engineering, partitioning Software, prototyping, Prototyping methods and tools, Specification principles, Representation, the software requirements specification and reviews, Analysis Modeling,

Section B

Testing and maintenance: Software Testing Techniques, Software testing fundamentals: objectives principles, testability; test case design, Unit testing: white box testing, basis path testing: Control structure testing: Black box testing, testing for specialized environments, architectures and applications. Software Testing Strategies; Verification and validation, Integration testing, Validation testing, alpha and beta testing, System testing: Recovery testing, security testing, stress testing, performance testing; The art of debugging, process

debugging approaches. Software re-engineering: Reverse engineering, restructuring, forward engineering.

Software Reliability and Quality Assurance: Quality concepts, Software quality assurance : SQA activities; Software reviews; cost impact of software defects, defect amplification and removal; formal technical reviews: The review meeting, review reporting record keeping, review guidelines; Formal approaches to SQA;

Text Books:

1. Pressman Roger S, *Software Engineering - A Practitioner's Approach*, MGH, New Delhi, New Delhi. Publications, New Delhi.
2. Ian Summerville, *Software Engineering*, *Pearson Education*, 5th Edition, New Delhi.

Reference Books:

1. Jalote Pankaj, *An Integrated Approach to Software Engineering*, Narosa Publications, New Delhi.
2. Mall Rajib, *Fundamentals of Software Engineering*, PHI, New Delhi.
3. Ali Bethforooz, Frederick J. *Software Engineering Fundamentals*, Hudson Oxford University.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	2	1	1	3	1	2	2	3	2	1
CO2	3	2	3	2	2	1	1	1	3	2	2	2	1	3	2
CO3	3	3	3	2	2	2	-	-	2	2	2	2	2	1	2
CO4	3	2	3	2	2	1	-	1	2	2	2	3	3	1	3
CO5	3	1	1	1	2	1	1	-	2	1	2	3	1	2	1
Average	**3**	**2**	**2.4**	**2**	**2**	**1.4**	**1**	**1**	**2.4**	**1.6**	**2**	**2.4**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Object Oriented Programming Lab

Course Code: 309209

Semester: 2nd

L T P

Credits: 02 **0 0 4**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Create and explain Basic C++ Program using i/o variables and structures.
CO2	Apply object oriented programming concepts using class and objects.
CO3	Analyze and Apply the generic classes concepts in programming problem.
CO4	Apply the concept of polymorphism and inheritance.
CO5	Illustrate and evaluate the file Input Output mechanisms.

Course Contents

Section A

Practical 1 Program to show the of use cin, cout

Practical 2 Program to implement the operators

Practical 3 Program based on decision making statement (if else)

Practical 4 Program based on the loops (while,do while)

Practical 5 Program based on loops (for), switch statement

Practical 6 Program based on structures and enumerated data types

Practical 7 Program based functions, overloaded functions

Practical 8 Program to show usage of storage classes.

Practical 9 Program to show usage of function overloading, default arguments

Practical 10 Program to show usage of classes, objects

Practical 11 Program to show usage of constructors, destructors

Practical 12 Program to manipulate arrays and array of objects

Practical 13 Program to manipulate strings.

Practical 14 Program to show usage of inheritance of various type (multiple, multilevel etc.)

Practical 15 Program to show usage of unary operator overloading

Practical 16 Program to show usage of binary operator overloading

Practical 17 Program for conversion from basic to user defined data type

Practical 18 Program for conversion from user defined to basic

Practical 19 Program to show usage of basics of pointers

Practical 20 Program to show usage of pointers and arrays.

Practical 21 Program to show usage of pointers, function arguments

Practical 22 Program to show usage of new, delete, memory management

Practical 23 Program to show usage of virtual function

Practical 24 Program to show usage of friend, static function

Practical 25 Program to show usage of overloaded assignment operator, this pointer

Practical 26 Program to read & write contents of a text file

Practical 27 Program to show usage of file pointers.

Practical 28 Program to show usage of command line arguments

Practical 29 Program to show usage of overloading of right & left shift operators.

Practical 30 Program to show usage of exception handling mechanism

Practical 31 Program to show usage of uncaught_exception(), the exception and bad_exception classes

Practical 32 Program to show usage of templates

Practical 33 Program to show usage of generic classes

Practical 34 Implementation of File handling

Practical 35 Implementation of Wrapper classes

Practical 36 Implementation of container classes

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	1	1	2	2	2	3	3	2	1
CO2	3	2	1	2	2	1	1	1	3	2	2	2	1	3	2
CO3	3	2	3	2	2	1	-	-	2	2	2	3	2	1	2
CO4	3	2	2	2	2	1	-	-	1	2	2	2	3	1	3
CO5	3	3	3	3	3	1	2	1	3	2	3	3	1	2	1
Average	**3**	**2.4**	**2.2**	**2.2**	**2.2**	**1**	**1.3**	**1**	**2.2**	**2**	**2.2**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Web Designing Lab

Course Code: 309210

Semester: 2nd

L T P

Credits: 03 **0 0 6**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Learn about the language of web: HTML/CSS.
CO2	Analyze a web page and identify its elements and attributes.
CO3	Create web pages using HTML and Cascading Style Sheets.
CO4	Build dynamic web pages using JavaScript.
CO5	Develop a fully functioning website and deploy on a web server.

Course Contents

1. Design the page with an attractive background color, text color and background image.
2. Write an HTML document with an example of Table format to print your Bio-Data.
3. Write an HTML document with an example of Table format to print your Telephone Bill and your CV.
4. Develop a complete web page using Frames and Frameset.
5. Write an HTML code for designing the subscription form of mail account in the e-mail website with appropriate fields.
6. Write an example of Style Sheet.
7. Mini Project 1(Using HTML and CSS)
8. How to use Glyphicons Component ,Bootstrap Dropdown Menu Component, Button Groups and Button Toolbar
9. How to build a Responsive Navbar using Bootstrap, use of Carousel , Cards , Buttons
10. Mini Project 2 (Using Bootstrap)
11. Basics of Java Script, variable, if-else, Loop, Functions etc.
12. How to turn on off light in java script web page using html and JavaScript
13. Write a program for Student Grade Calculator in JavaScript
14. Write a program for Dynamic Clock in JavaScript
15. Build a Notes Taking Website Using Pure JavaScript

16. Write a code for Car Running Project Using HTML, CSS, JavaScript.
17. Project 1: Creating a Gym Website Using HTML5 & CSS3 & Java Script ,Complete Web Development
18. Project 2: Building a College Library Website

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	1	1	2	2	2	3	3	2	1
CO2	3	2	2	2	3	2	-	1	2	2	2	3	1	3	2
CO3	3	3	3	2	2	1	1	1	3	2	3	3	2	1	2
CO4	3	2	2	2	2	1	1	-	2	2	3	2	3	1	3
CO5	2	3	3	2	2	1	1	1	2	1	2	2	1	2	1
Average	**2.8**	**2.6**	**2.4**	**2**	**2.2**	**1.2**	**1**	**1**	**2.2**	**1.8**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Computer Graphics and Multimedia

Course Code: 309301

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Identify and learn the details of the core concepts of computer graphics.
CO2	Understand the various input/output devices used for Computer Graphics.
CO3	Apply graphics programming techniques to design, and create computer graphics scenes.
CO4	Create to solve graphics programming issues, including 3D transformation etc.
CO5	Learn about the importance of viewing and projections.

Course Contents

Section A

Introduction: What is Computer Graphics, Computer Graphics Applications, Computer Graphics hardware and Software, Two dimensional Graphics primitives: Points and Lines

Point plotting Techniques: Coordinate system, Increment method , Line drawing algorithm : DDA, Bresenham‘s circle drawing algorithm: Using polar coordinates, Midpoint circle drawing algorithms, filled area algorithm: Scan line, Polygon filling algorithms, Boundary filled algorithms.

Point & Positioning devices: light pen, mouse, Tablet, Input technique, positioning technique, and character recognition.

Two Dimensional Geometric transformations: Translation, Scaling, Rotation, Other Transformations Reflection, shear, Homogenous Coordinate System

Clipping: point & line clipping algorithm,

Two Dimensional Viewing: Viewing pipeline, Window to view port transformation, Window to view port mapping

Section B

Three Dimensional Geometric transformations: Translation, Scaling and Rotation

Three Dimensional Viewing: Viewing pipeline, viewing coordinates, Projection: Parallel, perspective

Representation of 3-D curves and surfaces: Curved lines and surfaces, spline representations, interpolation and approximation splines, parametric continuity conditions.

Bezier curves and surfaces: Bezier curves, properties of Bezier curves, Bezier surfaces B-spline curves and surfaces.

Hidden Surfaces removal: Hidden surface elimination, depth buffer algorithm, scan line coherence algorithm, priority algorithm.

Text Books:

1. Hern & Baker, *Computer Graphics*, 2nd Ed, PHI, New Delhi.
2. Rogers ,*Principles of Computer Graphics*,MGH Pub New Delhi.
3. *Computer Graphics*, Schaum's Outline Series, MGH Publications.

Reference Books:

1. Foley, Dam Van, Feiner and Hughes,*Computer Graphics Principles and Practice*, 2nd Edition by,-Addison-Wesley Pub Company.
2. *Principles of Computer Graphics Theory & Practice Using Open G Land Maya*, University Press, Hyderabad.
3. *Computer Graphics*, A Programming Approach, Harrington.
4. Kanetkar Yashwant, *Graphics Programming with C*, BPB Publications, New Delhi

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	2	1	1	2	2	2	2	3	3	2	1
CO2	3	1	2	1	3	2	1	1	2	2	1	2	1	3	2
CO3	3	2	3	2	3	1	-	-	2	3	2	3	2	1	2
CO4	3	3	3	3	2	1	1	1	2	3	2	2	3	1	3
CO5	2	2	1	1	2	1	1	-	2	2	2	3	1	2	1
Average	**2.8**	**1.8**	**2.2**	**1.8**	**2.4**	**1.2**	**1**	**1.3**	**2**	**2.4**	**1.8**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Communication & Computer Networks

Course Code: 309302

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Learn about the network topologies.
CO2	Enumerate the layers of the OSI model and TCP/IP.
CO3	Understand the data link layer and network protocols.
CO4	Interpret the components, tools and techniques of communication systems.
CO5	Test the performance of a single link, logical process-to-process (end-to-end) channel, a network as a whole (latency, bandwidth and throughput).

Course Contents

Section A

Introduction to Computer Networks and its uses, Network categorization and Hardware: Broadcast and point-to-point networks, Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Internetworks, Topologies, Wireless networks, **Network Software:** Protocols, Services, network architecture, design issues, OSI Reference model, TCP/IP Reference model, Comparison of OSI and TCP/IP Models. Introduction to Example Networks: Internet, Connection-Oriented Networks – X.25, Frame Relay, ATM.

Data Communication Model, Digital and Analog data and signals, bit rate, baud, bandwidth, Nyquist bit rate, Guided Transmission Media – Twisted Pair, Coaxial cable, Optical fiber; wireless transmission – Radio waves, microwaves, infrared waves; Satellite communication.

Switching: Circuit Switching, Packet Switching; Multiplexing: Frequency Division Multiplexing Time Division Multiplexity, Synchronous and Asynchronom TDM, Modems, Transmission Impairments, Manchester and Differential Manchester encoching, ADSL Versus Cable.

Section B

Data Link Layer Design issues: Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Window Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wavelength division Multiple access protocol, Digital Cellular, Radio: Global System for Mobile Communication (GSM), Code Division Multiple Access(CDMA), Fiber Distributed Data Interface, Distributed Queue Dual Bus (DQDB).

Network Layer Design issues : Virtual Circuit and Datagram Subnet, Routing Algorithms, Optimality principle, Shortest path Routing, Flooding , Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast and Multi Cast Routing, Routing for Mobile hosts, Routing in Adhoc Networks,, congestion Control Algorithms, General Principals Traffic Shaping, Leaky bucket token bucket, choke packets, Load Shedding.

References:

1. Tanenbaum Andrew s, *Computer Networks*, PHI.
2. Forouzan, *Introduction to Data communications and Networking*, Tata Mc-Graw Hill.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	2	1	2	2	2	3	3	2	1
CO2	3	3	2	2	2	2	1	1	3	2	2	3	1	3	2
CO3	2	2	2	3	2	2	1	1	2	2	3	3	2	1	2
CO4	1	1	2	2	1	1	-	-	3	3	2	2	3	1	3
CO5	2	2	2	2	2	3	1	1	2	2	3	2	1	2	1
Average	**2.2**	**2**	**2**	**2.2**	**1.8**	**2.2**	**1.2**	**1**	**2.4**	**2.2**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Artificial Intelligence

Course Code: 309303

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Learn about the various searching techniques, constraint satisfaction problem.
CO2	Classify the role of agents and the way of evaluating it.
CO3	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
CO4	Compare different machine learning techniques to design AI machine and enveloping applications for real world problems
CO5	Acquire the knowledge of real world Knowledge representation.

Course Contents

Section A

Concept of intelligence: An Overview of AI: The AI problems, what is an AI technique; Characteristics and applications of AI, General Problem solving: Production systems; Control strategies; forward and backward chaining, Exhaustive searches: Depth first Breadth first search.

Heuristic Search Techniques: Hill climbing, Branch and Bound technique; Best first search and A* algorithm; AND/OR Graphs; Problem reduction; Constraint Satisfaction problems Game Playing Min Max Search procedure; Alpha-Beta cutoff; Additional Refinements.

Section B

Knowledge Representation Techniques: First Order Predicate Calculus; Inference Mechanisms Horn's Clauses; Semantic Networks; Frame Systems; Scripts; Conceptual Dependency, AI Programming Languages: Introduction to LISP, Syntax and Numeric Function; List manipulation functions; Iteration and Recursion; Property list and Arrays.

Natural Language Processing and Parsing Techniques: Context Free Grammar; Recursive Transition Nets (RTN); Augmented Transition Nets (ATN); Semantic Analysis,

Case and Logic Grammars; Probabilistic Reasoning and Uncertainty: Probability theory; Bayes

Theorem and Bayesian networks; Certainty Factor. Introduction to Expert Systems, Architecture of Expert Systems,

Text Books:

1. Rich Elaine, KnightKevin, (2008) *Artificial Intelligence***,** 3rd Edition, Tata McGraw Hill.
2. Patterson Dan W,**(**1999) *Introduction to Artificial Intelligence and Expert Systems*, Prentice Hal of India.
3. Rusell Stuart, Norving Peter,*(*2009) *Artificial Intelligence: A Modern Approach*, Pearson Education 2nd Edition.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	3	1	1	2	3	2	2	3	2	1
CO2	2	2	2	2	3	2	1	1	2	2	2	2	1	3	2
CO3	2	3	2	2	2	2	-	1	2	3	2	3	2	1	2
CO4	3	3	3	3	2	3	2	-	3	2	3	3	3	1	3
CO5	2	3	2	2	3	3	1	1	2	2	3	3	1	2	1
Average	**2.4**	**2.8**	**2.2**	**2.2**	**2.4**	**2.6**	**1.2**	**1**	**2.2**	**2.4**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Programming Using Python

Course Code: 309304

Semester: 3rd

L T P

Credits: 05 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to

CO	Statement
CO1	Learn about the variable, expression and statements.
CO2	Apply conditional and looping constructs.
CO3	Design and import functions in python programming.
CO4	Attain the basics of Strings and Dictionaries.
CO5	Utilize basic operations on File.

Course Contents

Section A

Introduction to Python

Getting Started: Introduction to Python- an interpreted high level language, interactive mode and script mode.

Variables, Expressions and Statements: Values, Variables and keywords; Operators and Operands in Python: (Arithmetic, relational and logical operators), operator precedence, Expressions and Statements (Assignment statement); Taking input (using raw_input() and input()) and displaying output(print statement);Putting Comments

Conditional constructs and looping: if else statement While, For (range function), break, continue, else, pass, Nested loops, use of compound expression in conditional constructs and looping

Functions: Importing Modules (entire module or selected objects), invoking built in functions, functions from math module, using random () and randint () functions of random module to generate random numbers, composition.

Defining functions, invoking functions, passing parameters, scope of variables, void functions and functions returning values, flow of execution

Section B

Strings: Creating, initializing and accessing the elements; String operators: +, *, in, not in, range slice [n:m]; Comparing strings using relational operators; String functions & methods: len, capitalize, find, isalnum, isalpha, isdigit, lower, islower, isupper, upper, lstrip, rstrip, isspace, istitile, partition, replace, join, split, count, decode, encode, swapcase, Pattern Matching

Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements;List operations (joining, list slices);List functions & methods: len, insert, append, extend, sort, remove, reverse, pop

Dictionaries: Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, traversing, appending, updating and deleting elements. Dictionary functions & Methods: cmp, len, clear(), get(), has_key(), items(), keys(), update(), values()

Tuples: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple()

Input and Output: Output Formatting, Reading and Writing Files

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions

Text Books:

1. Dawson Michael, *Programming with python*, A users Book Cengage Learning.
2. Beazley David, *Python Essential Reference*, Third Edition.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	1	3	2	2	2	3	2	1
CO2	3	2	2	2	2	1	1	1	1	1	2	2	1	3	2
CO3	3	2	3	2	2	2	1	-	1	1	2	2	2	1	2
CO4	3	2	2	2	2	1	-	2	1	2	2	2	3	1	3
CO5	3	3	3	2	2	2	1	-	2	2	2	2	1	2	1
Average	**3**	**2.2**	**2.4**	**2**	**2**	**1.6**	**1**	**1.3**	**1.6**	**1.6**	**3**	**3**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Theory of Computation

Course Code: 309305

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Recognize and comprehend formal reasoning languages.
CO2	Use basic concepts of formal languages of finite automata techniques
CO3	Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
CO4	Analyze Context Free languages, Expression and Grammars.
CO5	Design different types of Push down Automata as Simple Parser.

Course Contents

Section A

Introduction: Basic Terminology: Alphabet, Formal Language and operations on formal languages, Examples of formal languages.

Finite automata : Concept of Basic Machines, Properties and Limitations of Finite State Machines, Deterministic Finite Automata(DFA),Non-Deterministic Finite Automata(NFA), Equivalence of DFA and NDFA , Non-Deterministic Finite automata with Λ-Transitions.

Regular expression: Regular Languages and Regular Expressions, Kleen's Theorem. Arden's Method.

Properties of Regular sets: The Pumping Lemma for Regular sets, Application of the Pumping Lemma, Closure Properties of Regular Sets, Myhill- Nerode Theorem and Minimization of Finite Automata, Minimization Algorithm.

Finite Automata with output: Moore and Mealy Machines. Equivalence of Moore and Mealy Machines.

Section B

Context Free Grammars: Examples and Definitions, Derivation trees and ambiguity, An Unambiguous CFG for Algebraic Expressions. Regular Grammar, Simplified forms and Normal forms: Removal of useless symbols and unit production, Removal of Λ-moves, Chomsky Normal Form (CNF), Griebach Normal Form (GNF).

Pushdown Automata: Introduction and Definition of Push-Down Automaton , Applications of Push Down Automata.

Turing Machines: Definitions and Examples, Deterministic and Non- Deterministic Turing Machines, Unsolvable Problems: A Non recursive Language and an Unsolvable Problem, PCP Problem and MPCP Problem.

More General Languages and Grammars: Recursively Enumerable and Recursive Languages, Unrestricted grammars, Context sensitive Language and grammar. Relation between languages of classes, Chomsky hierarchies of grammars.

Text Books:

1. Martin J.C, *Introduction to Languages and Theory of Computation***,** Tata Mc Graw-Hill Publising Company Limited, 3rd Edition.
2. Hopcroft J.E. and Ullman J.D, *Introduction to Automata Theory Languages and Computation*, Narosa Publications.

Reference Books:

1. Sipser, *Theory of Computation*, Cengage Learning.
2. Daniel I.A. Cohen, *Introduction to computer Theory*, John Wiley.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	1	1	2	1	2	2	3	2	1
CO2	3	2	2	2	1	2	2	-	2	2	2	2	1	3	2
CO3	3	2	2	2	2	1	1	1	2	2	2	2	2	1	2
CO4	3	2	2	2	2	3	-	2	3	3	2	2	3	1	3
CO5	3	3	3	2	3	3	-	-	3	2	3	3	1	2	1
Average	**2.8**	**2.2**	**2.2**	**2**	**2**	**2**	**1.3**	**1.3**	**2.4**	**2**	**2.2**	**2.2**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Workshop on JAVA

Course Code: 309306

Semester: 3rd

L T P

Credits: 02 **0 0 4**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Get knowledge about the structure and model of the Java programming language.
CO2	Implement the given problems in Java programming language.
CO3	Develop software in the Java programming language.
CO4	Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements.
CO5	Get learning ability to connect Java programs to database using JDBC.

Course Contents

Section A

1. Implementation of classes, inheritance, overloading.
2. Implantation of packages and interfaces
3. Implantation of threads.
4. Implementation of Applets, mouse events, and keyboard events.
5. Connecting to Database using JDBC.
6. Deployment of Servlets, JSP and EJB.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	3	1	2	3	2	3	3	3	2	1
CO2	3	2	3	2	2	3	-	-	3	2	3	3	1	3	2
CO3	3	3	3	2	2	2	1	1	3	2	2	3	2	1	2
CO4	3	3	3	2	2	2	1	-	3	2	2	2	3	1	3
CO5	3	2	2	2	3	2	1	1	3	2	3	3	1	2	1
Average	**3**	**2.4**	**2.6**	**2**	**2.2**	**2.4**	**1**	**1.3**	**3**	**2**	**2.6**	**2.8**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Cloud Computing

Course Code: 309307

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Provide students with the fundamentals and essentials of Cloud Computing.
CO2	Learn about the concept of Cloud Security.
CO3	Understand the Concept of Cloud Infrastructure Model.
CO4	Understand the key technical and organisational challenges.
CO5	Interpret the importance of virtualization in distributed computing.

Course Contents

Section A

Introduction to Cloud Computing: Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired

Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Cloud Infrastructure Management, Infrastructureas a Service Providers, Platform as a Service Providers, Challenges and Risks, Assessing the role of Open Standards.

Cloud Architecture, Services and Applications: Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, SaasVs. Paas, Using PaaS Application Frameworks, Software as a Service, Identity as a Service, Compliance as a Service.

Section B

Abstraction and Virtualization: Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hyper visors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context.

Managing & Securing the Cloud: Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, Establishing Identity and Presence.

Case-Studies: Using Google Web Services, Using Amazon Web Services, Using Microsoft Cloud Services.

Text Books:

1. Buyya R, Broberg J, Goscinski A, (2011) *Cloud Computing: Principles and Paradigm*, John Wiley, First Edition & Sons.
2. Sosinsky B, (2011) *Cloud Computing Bible*, First Edition, Wiley Edition.

Reference Books:

1. Miller Michael, *Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate Online*, Pearson Education India.
2. Smooth S., Tan N,(2011) *Private Cloud Computing*, Morgan Kauffman, First Edition.
3. Linthicium D, *Cloud Computing and SOA Convergence in Enterprise* **,** Pearson Education India.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	1	1	3	2	2	2	3	2	1
CO2	2	2	2	2	2	2	1	1	3	2	2	2	1	3	2
CO3	3	2	3	3	2	2	1	-	3	2	2	3	2	1	2
CO4	3	2	2	2	2	2	1	-	3	2	3	3	3	1	3
CO5	2	3	3	3	3	2	-	1	3	2	3	3	1	2	1
Average	**2.6**	**2.2**	**2.4**	**2.4**	**2.2**	**2**	**1**	**1**	**3**	**2**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Storage Area Network

Course Code: 309308

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Get knowledge about the fundamentals of storage centric and server centric systems.
CO2	Learn about the RAID concepts.
CO3	Aquatinted with the metrics used for Designing storage area networks.
CO4	Understand the backup/recovery topologies.
CO5	Interpret the local replication and remote replication technologies and their operation.

Course Content

Section A

Introduction to Information Storage and Management, Storage System Environment

Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

Data Protection, Intelligent Storage system

Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares Components of an Intelligent Storage System, Intelligent Storage Array

Section B

Direct-Attached Storage, SCSI, and Storage Area Networks

Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fiber Channel, The SAN and Its Evolution, Components of

SAN, FC Connectivity, Fiber Channel Ports, Fiber Channel Architecture, Zoning, Fiber Channel Login Types, FC Topologies.

NAS, IP SAN

General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability. iSCSI, FCIP.

Content-Addressed Storage, Storage Virtualization

Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization

Text Books:

1. Somasundaram G., Shrivastava Alok, (2009) *Information Storage and Management: Storing, Managing & Protecting Digital Information in Classic, Visualized and Cloud Environments*, 2nd edition, EMC Education Services, Wiley India.

Reference Books:

1. Troppens Ulf, Erkens Rainer and Muller Wolfgang, (2003) *Storage Networks Explained*, Wiley India.
2. Spalding Rebert, (2003)*Storage Networks*, The Complete Reference, Tata McGraw Hill.
3. Barker Richard and Massiglia Paul, *Storage Area Networks Essentials A Complete.*

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	3	2	2	1	2	2	3	3	3	2	1
CO2	2	3	2	2	3	1	-	1	3	3	2	3	1	3	2
CO3	2	-	2	2	3	1	1	-	3	3	3	3	2	1	2
CO4	3	3	3	3	2	2	-	-	3	2	2	2	3	1	3
CO5	3	-	2	-	3	2	1	1	2	3	2	2	1	2	1
Average	**2.6**	**2.6**	**2.2**	**2.2**	**2.8**	**1.6**	**1.3**	**1**	**2.6**	**2.6**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Data Analytics
Course Code: 309309

Semester: 3rd

L T P

Credits: 04 **4 0 0**

Course Outcomes: On successful completion of this course, the students will be able to:

CO	Statement
CO1	Understand the relevant programming abilities.
CO2	Learn about visualization techniques.
CO3	Build and assess data-based models.
CO4	Execute statistical analyses with professional statistical software.
CO5	Polish the skills in data management.

Course Content

Section A

Introduction and Data Exploration: Introduction, Data and Relations-Matrix representation, variable measures, sequential relation, sampling and quantization. Data Pre-processing: Cleaning, Transformation, Basic Visualization-PCA, multidimensional scaling, Histograms, Correlation.

Predictive Modeling and Optimization: Linear and non-linear regression, Feature Selection. Forecasting - Recurrent Models, Classification-Rules, Trees, Naïve Bayes, SVM, Vector Quantization. Evaluation Metrics-Validation and Interpretation.

Section B

Optimization and Clustering: Optimization Methods – With derivatives, Gradient Descent. Clustering - Cluster Partition, Sequential, Prototype-Based, Relational, Cluster Validity and Self Organizing Map.

Mathematical Modeling and Spatial Data : Introduction to Multi-criteria Decision Making, Using Numerical Methods in Data Science, Mathematical Modeling with Markov Chains. Modeling Spatial Data with Statistics- Getting predictive surfaces from special point data, Using trend surface analysis on spatial data.

Text Books and Reference Books:

1. Runkler, Thomas. A, (2012) *Data Analytics: Models and Algorithms for Intelligent Data Analysis*, Springer.
2. Lillean Pearson, (2015) *Data Science for Dummies*, John Wiley and Sons, Essential Reading / Recommended Reading.
3. Jain P and Sharma P, (2014) *Behind Every Good Decision: How Anyone Can Use Business Analytics to Turn Data into Profitable Insight*, Amacom.

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	2	-	1	3	2	2	3	3	2	1
CO2	3	2	3	2	2	2	1	1	2	2	2	3	1	3	2
CO3	3	2	3	3	2	1	1	-	2	3	2	3	2	1	2
CO4	3	2	2	2	2	2	-	1	1	2	3	3	3	1	3
CO5	3	2	3	3	3	3	2	-	2	2	3	3	1	2	1
Average	**3**	**2**	**2.8**	**2.6**	**2.4**	**2**	**1.3**	**1**	**2**	**2.2**	**2.4**	**3**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Programming Using Python

Course Code: 309310

Semester: 3rd

L T P

Credits: 03 **0 0 6**

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Develop solutions for a range of problems using python programming.
CO2	Implement the basic conditional and looping constructs.
CO3	Write the code to implement List and tuple in Python programming tools.
CO4	Use the various algorithms in python programming.
CO5	Develop solutions of real time problems.

Course Contents

List of Experiments:

PROGRAM 1: Hello World

PROGRAM 2: Add numbers and Concatinate strings

PROGRAM 3: Input from user

PROGRAM 4: Loops

PROGRAM 5: If-Else - Conditional Checking

PROGRAM 6: Functions

PROGRAM 7: Math library

PROGRAM 8: Strings

PROGRAM 9: Exceptional Handling

PROGRAM 10: Random Numbers/String

PROGRAM 11: Demo of Data Structure - List

PROGRAM 12: Demo of Data Structure - Dictionary

PROGRAM 13: Demo of Data Structure - Touple

PROGRAM 15: Command Line Argument

The mapping of PO/PSO/CO attainment is as follows:

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	-	-	2	3	2	3	3	2	1
CO2	3	2	2	2	2	2	1	1	2	2	3	2	1	3	2
CO3	3	2	3	2	3	2	-	1	2	3	2	3	2	1	2
CO4	2	3	2	3	2	3	1	1	2	3	2	2	3	1	3
CO5	3	2	3	3	2	2	2	-	2	2	3	3	1	2	1
Average	**2.8**	**2.4**	**2.4**	**2.4**	**2.2**	**2.2**	**1.3**	**1**	**2**	**2.6**	**2.4**	**2.6**	**2**	**1.8**	**1.8**

The Correlation levels are: "1" – Low Correlation, "2" – Medium Correlation, "3" – High Correlation and "-" indicates there is no correlation.

Course Name: Industrial Training/Internship (6 Months)

Course Code: 309401

Semester: 4th

Credits -02

L T P
0 0 0

Course Outcomes: On successful completion of this course, the students will able to:

CO	Statement
CO1	Become master in one's specialized technology.
CO2	Update oneself with all the latest changes in technological world.
CO3	Communicate efficiently.
CO4	Analyze and understand the environment of the organization.
CO5	Develop to cognizance of the importance of management principles.

Total Number of Course	29
Number of Theory Course	22
Number of Practical Course	7
Total Number of Credits	107

Annexure-4

Academic Instructions

Attendance Requirements

A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (50)						**External (50)**	**Total**
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	10	10	10	10	30	30	50	
Average Weightage	10	10			30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.

ਇਹ ਹੈ ਪ੍ਰਗਟ ਹਮਾਰੀ ਕਾਸ਼ੀ
GKU