Master of Science (Computer Science)[M.Sc.(CS)]

SEMESTER-I

Code	Subject	Type of Course	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
PG1.1	Operating Systems	Major (Core)	4	-	4	50	50	100
PG1.2	Data Communications and Networking	Major(Core)	4	-	4	50	50	100
PG1.3	Data Structures and Analysis of Algorithm	Major(Core)	2	-	2	0	50	50
PG1.4	Data Structures and Analysis of Algorithm-Lab	Major (Core)	-	2	2	25	25	50
PG1.5	Operating Systems-Lab	Major (Core)	-	2	2	25	25	50
PG1.6	Elective-I-	Major (Elective)	4	-	4	50	50	100
PG1.7	Research Methodology	Minor Stream (RM)	4	-	4	50	50	100
	Total				**22**			**550**

SEMESTER-II

Code	Subject	Type of Course	L	Pr.	Cr.	Int. Exam.	Ext. Exam.	Total Marks
PG2.1	Data Warehousing and Data Mining	Major (Core)	4	-	4	50	50	100
PG2.2	Database Management Systems	Major (Core)	4	-	4	50	50	100
PG2.3	Introduction to Microprocessors	Major (Core)	2	-	2	50	0	50
PG2.4	Database Management Systems-Lab	Major (Core)	-	2	2	25	25	50
PG2.5	Web Technology-Lab	Major (Core)	-	2	2	25	25	50
PG2.6	Elective-II-	Major (Elective)	4	-	4	50	50	100
PG2.7	OJT/RP	RP/OJT		4	4	50	50	100
	Total				**22**			**550**

SEMESTER-III

Code	Subject	Type of Course	L	Pr.	Cr.	Int.Exam.	Ext.Exam.	Total Marks
PG3.1	Big Data Analytics	Major (Core)	4	-	4	50	50	100
PG3.2	Machine Learning	Major (Core)	4	-	4	50	50	100
PG3.3	Data Science	Major (Core)	2	-	2	0	50	50
PG3.4	Big Data Analytics-Lab	Major (Core)	-	2	2	25	25	50
PG3.5	Machine Learning-Lab	Major (Core)	2	-	2	25	25	50
PG3.6	Elective-III	Major (Core)	4	-	4	50	50	100
PG3.7	RP	RP	4	-	4	50	50	100
	Total				22			550

SEMESTER-IV

Code	Subject	Type of Course	L	Pr.	Cr.	Int.	Ext.	Total
PG4.1	Deep Learning	Major (Core)	4	-	4	50	50	100
PG4.2	Natural Language Processing	Major (Core)	4	-	4	50	50	100
PG4.3	Mobile Application Development using Android Programming	Major (Core)	-	2	2	25	25	50
PG4.4	Natural Language Processing-Lab	Major (Core)	-	2	2	25	25	50
PG4.5	Elective-IV/(MOOC/Swayam)	Major (Core)	4		4	50	50	100
PG4.6	OJT/RP	OJT/RP	6		6	100	50	150
	Total				22			550

Elective-I	Elective-II
1.Cyber Security	1.Ethical Hacking
2.Digital Image Processing	2.Project Management
3.Software Engineering	3. Fuzzy Logic & Neural Network
4.Artificial Intelligence	4.IoT

Elective-III	Elective-IV
1.Blockchain	1.Information Security
2.GIS and Remote Sensing	2.Digital Forensics
3.SoftwareTesting	3.Agile Methodology
4.Robotic Process Automation	4.Cloud Computing

SEMESTER				1Credit	= 25 Marks
I	II	III	IV	Total Credits	=88
22	22	22	22	Total Marks	=88*25 =2200

ASSESSMENT:

(I)   The final total assessment of the candidate is made in terms of an internal assessment and an external assessment for each course.

1. For each theory paper, 2 credit will be based on internal assessment and 2credits for end examination (external assessment), whereas the lab papers1credit is for internal and one for external.
2. It is mandatory to pass the internal exam of each Subject and hence is eligible for external exams.
3. The division of the 25marks allotted to internal assessment of theory papers is on the basis of Attendance of 5 marks and5 assignment throughout the semester of 5 marks and two written test of15markseachtakenduringthe semester(average of two should be taken).
4. Themarksofthepractical's/labwouldbegivenonexternalpracticalexam&oral.
5. NoTheoryQuestionsorExamstobeconducted.OnlyProgramswillbeasked.OutputQuestionscanbe asked.
6. The internal marks will be communicated to the University at the end of each semester. These marks will be considered for the declaration of the results.

(II)   Examination:
Examinations shall be conducted at the end of the semester i.e. During December and in May, However supplementary examinations will also be held in December and May.

Students have to pass both the internal assessment and external assessment separately.

Total marks obtained =Internal marks + External marks

M.Sc.(C.S.)DETAILEDSYLLABUS

Semester-I

Branch: M.Sc.(C.S.)	Semester-I
Subject Code: PG1.1	Lecture:04 Credit:04
Subject Title	OPERATING SYSTEMS

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weight age%
UNIT-I	1	**Introduction to Operating Systems(OS):** Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special-Purpose Systems, Computing Environments. Operating-System Services, User Operating-System Interface, System Calls, Types of System Calls, System Programs, Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation.	5	10
UNIT-II	2	**Processor Management:** Process concept, Process scheduling, Operations on Processes, Inter-process Communication, Multithreading models, threading issues, Process scheduling algorithms, Thread scheduling, Multiple processor Scheduling. **Process Coordination**: Synchronization, Semaphores, Monitors, Deadlocks characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock detection, recovery from deadlock.	10	20
	3	**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation **Virtual memory Management:** Demand Paging, Copy-on-Write, Page replacement, Allocation of Frames, Thrashing.	10	20

UNIT-III	4	**File Management:** File Concept, File Access Methods, Directory Structure, File Sharing, File Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, Log-Structured File Systems, NFS. **I/O Management:** I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations, STREAMS, Performance. **Disk Management:** Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Stable - Storage Implementation, Tertiary - Storage Structure	10	20
	5	**Distributed systems:** Types of Distributed Operating, Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness, Design Issues. **Distributed File Systems:** Naming and Transparency, Remote File Access, Stateful Versus Stateless Service, File Replication **Distributed Coordination:** Event Ordering, Mutual Exclusion, Atomicity, Concurrency Control, Deadlock Handling, Election Algorithms, Reaching Agreement	10	20
UNIT-IV	6	**Protection and Security:** Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights, Capability-Based Systems, Language-Based Protection. The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications	5	10

Reference Books:

1. Abraham Silberscatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 7th Ed.JohnWileyandSons,Inc2005.
2. MilanMilenkovic,OperatingSystemsConceptsAndDesign",SecondEdition,McGraw-HillInternationalEditions,"
3. WilliamStallings,"OperatingSystems:InternalsanddesignPrinciples",5thEdPrentice Hall,2005.
4. AndrewTanenbaum,"Modernoperatingsystems"3rdEd,PearsonEducation.

Branch: M.Sc.(C.S.)	Semester-I
Subject Code:PG1.2	Lecture:04 Credit:04
Subject Title	DATA COMMUNICATIONS AND NETWORKING

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weight age%
UNIT-I	1	**Introduction:** Computer Networks and its uses, Network categorization and Hardware : Broadcast and point-to-point networks, Local Area Network (LAN), Metropolitan Area Network(MAN), Wide Area Networks (WAN), Inter networks, 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,FrameRelay,ATM	6	15
	2	**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.	4	10
UNIT-II	3	**Switching:** Circuit Switching, Packet switching; Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Synchronous and Asynchronous TDM, Modems, Transmission impairments, Manchester and differential Manchester encoding.	6	15
	4	**Error Detection and Correction:** Types of errors Redundancy, Detection Versus Correction, Error Detection, Error Correction, Hamming Code, Cyclic Redundancy Check, Check sum and Its idea.	8	15
UNIT-III	5	**Data Link Layer Design issues:** Framing, error control, Flow Control, Error Detection and correction; Elementary Data Link Protocols, Sliding Windows Protocols; Medium Access Control: Aloha, CSMA protocols, Collision free protocols, Limited Contention Protocols; Wave length division Multiple access protocol, Wireless LAN Protocol: MACA; IEEE 802.3Ethernet, IEEE 802.4 Token Bus; IEEE 802.5 Token ring, Binary Exponential Back off algorithm, Digital Cellular, Radio : Global System for Mobile	14	25

| UNIT-IV | 6 | **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, RoutingforMobilehosts,RoutinginAdhocNetworks,cong estionControlAlgorithm,GeneralPrincipalsTraffic Shaping, Leaky Bucket, Token Bucket, choke packets, Load Shedding | 12 | 20 |

Reference Books:

1. Behrouz A. Forouzan. Data Communications and Networking (4thEdition).McGraw Hill. ©2007.ISBN:0-07-296775-7.
2. Data and Computer Communications,10thed.,by William Stallings, Pearson
3. Computer Networks, Andrew S. Tanenbaum 5thedition.

Branch :M.Sc.(C.S.)	Semester-I
SubjectCode:PG1.3	Lecture:02 Credit:02
Subject Title	DATA STRUCTURES AND ANALYSIS OF ALGORITHM

Modules	Sr. No:	Topics and Details	No. of lectures assigned	Marks Weight age
UNIT-I	1	**Introduction:** Data types, ADT, data structure: Definition & classification Analysis of algorithms (recursive and non-recursive) with emphasis on best case, average case and worst case	4	10
UNIT-II	2	**Linear Data structures with applications:** **List:** Introduction, implementation using array & linked list (singly, doubly, circular, multi-list), Applications: Polynomial representation, Sparse matrix **Stack:** Introduction, implementation using array & linked list, Applications: Function call, Recursion, balancing of parenthesis, Polish Notation: infix to post fix conversion and evaluation of post fix expression **Queue:** Introduction (queue, circular queue, deque, priority queue), implementation using array &linked list, Applications: Job Scheduling.	12	10

UNIT-III	3	**Non Linear data structures:** **Tree:** Introduction and representation, Forest, Tree traversal, Binary Tree (representation using array and links): Binary tree traversal (recursive & non-recursive implementation), Expression tree **Graph:** Introduction, representations, Traversal (BFS, DFS),Applications: Shortest path (Single source-all destinations), Minimal spanning tree (Prim's algorithm, Kruskal's algorithm)	12	10
UNIT-IV	4	**Searching and Sorting:** Linear Search, Binary Search, Transpose sequential search, Binary search tree, Heap tree (application in priority queue and sorting), AVL tree, Splay tree, M-way search tree, B tree (insertion), B+ tree (Definition and introduction), B*tree (Definition and introduction), Tries, Application of B tree and B+ tree in File Structures **Hash Tables:** Introduction, hash functions and hash keys, Collisions, Resolving collisions, Rehashing **Sorting with algorithm analysis**(best case, worst case, average):Bubble, Selection, Insertion, Shell, Merge, Quick, Heap, Radix	14	10
	5	**NP-Completeness and the P & NP Classes** Introduction, Polynomial Time & Verification, NP-Completeness and Reducibility, The Vertex Cover Problem, The Traveling Salesman Problem, The Set Covering Problem	8	10

Reference Books:
1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", PearsonEducation,2ndedition(2003)
2 G. A. V. PAI, "Data structures and algorithms, concepts,TechniquesandApplications",1stedition(2008)
3 Horowitz, Sahni, Anderson-Freed, "Fundamentals of Data Structures in C", University Press (2ndedition-2007)
4 Jean-PaulTremblay,PaulG.Sorenson,"AnIntroductiontoDataStructureswith Applications",TataMcGraw-Hill,2Edition,(2007)
5 Cormen,Leiserson,Rivest,Stein,"IntroductiontoAlgorithm",PHI(2003),2ndEdition
6 Gilberg&Forouzan,"DataStructures:APseudo-codeApproachwithC",ThomsonLearning
7 Parag Dave & Himanshu. Dave, "Design and Analysis of Algorithms ", Pearson Education(2008)
8 Tanenbaum," Data Structures Using C & C++",PHI.
9 MichelGoodrich,RobertoTamassia,"Algorithmdesign-foundation,analysis&internetexamples",Wiley
10 AVAho, JEHopcroft, JDUllman,"Data Structures & Algorithms", Addison-Wesley Publishing(1983).
11 Michael Berman, "Data Structures Via C++: Objects by Evolution", Oxford Univ. Press(2004)

12 DEKnuth,"Sorting&Searching-TheArtofComputerProgramming",Vol.3, Addison-Wesley Publishing(1973).
13   Seymour Lipschutz, "Data Structures with C"McGrawHill,2017.
14 Yashawant Kanetkar, Data Structures Through C,BPB publications.

Branch: M.Sc.(CS)	Semester-I
Subject Code: PG1.4	**PRACTICAL:02** **CREDIT:02**
Subject Title	**DATA STRUCTURES AND ALGORITHMLAB**

Modules	Sr. No:	Topics and Details	No. of Lectures assigned	Marks Weight age
UNIT-I	1	Implementation of linear data structure Array.	3	06
	2	Implementation of Searching and Sorting Algorithms	4	
UNIT-II	3	Implementation of linear data structure Linked List.	4	20
UNIT-III	4	Implementation of stack, queue, enqueue, dequeue.	4	
UNIT-IV	5	Implementation of Tree data structure.	6	24
	6	Graph: DFS, BFS.	4	

Reference Books:

1. Data Structures Using C and C++:Langsam Y, PHI,2ndEd.
2. Magnifying Data Structures: Arpita Gopal, PHIL earning.
3. DataStructuresthroughC:Y.P.Kanetkar,BPBPublications,2nd Ed

Branch: M.Sc.(CS)	Semester-I
Subject Code: PG1.5	**Practical:02** **Credit:02**
Subject Title	**Operating System Lab**

Modules	Sr. No:	Topics and Details	No. of Lectures assigned	Marks Weight age%
UNIT-I	1	Installation of OS on Virtual Machine (VM, Oracle BOX etc) **FileCommands:**ls,cp,mv,rm,ln,cd,mkdir,rmdir,chown,chgrp,chmod,gzip,tar,updated,find. **Commands to Access File Contents:** cat, less, diff **File Systems: Mount, umount** **System Commands:** System Information: df, du, free, Date	2	5
	2	**Processes:** top, ps, kill, killall **Network:** ping, nslookup, telnet Other: IOSTAT, SAR, Pstat, Netstat command and its parameters.	3	

UNIT-II	3	**The grep Family:** The grep Command, grep Examples with Regular Expressions, grep with Pipes, grep with Options, egrep(Extended grep),Fixed grep or Fast grep	5	20
UNIT-III	4	**Introduction to UNIX Shells:** Definition and Function, System Startup and the Login Shell, Processes and the Shell, The Environment and Inheritance, Executing Commands from Scripts. The Interactive Bourne Shell, The C Shell, The KornShell, The Interactivebash Shell Regular Expressions, Combining Regular Expression Meta characters	5	5
UNIT-IV	5	**ProgrammingwiththebashShell:**IntroductionSection,ReadingUserInput,Arithmetic,PositionalParametersandCommandLineArguments,ConditionalConstructsandFlowControlSection,LoopingCommands,FunctionsSection,TrapingSignals,Debugging,ProcessingCommandLineOptionswithgetopts,TheevalCommandandParsing The Command Line, bash Options, Shell Built –In Commands.	10	20

Reference Book:
1. "UnixShellbyExamples"4thEdition,EllieQuigley,PearsonEdition
2. "Sed&Awk",2ndEdition,DaleDoughertyandArnoldRobbins
3. "IntroductiontoUnixandShellProgramming",PearsonEducation,M.G.Venkateshmurthy
4. Advanced Linux Programming, Mark Mitchell, Jeffrey Oldham, and Alex Samuel, New Riders Publishing
5. Unix/Linux Programming by Sumitabha Das, PHP

Electives of Semester-I

Branch: M.Sc.(C.S.)	Semester-I
Subject Code: PG1.6.1	**Lecture:04 Credit:04**
Subject Title	**Elective-I: Cyber Security**

Modules	Sr.. No.	Topic and Details	No. of Lectures Assigned	Marks Weight age%
UNIT-I	1	**Introduction to Cyber Security** Overview of Cyber Security, Internet Governance– Challenges and Constraints, Cyber Threats:- Cyber Warfare- Cyber Crime-Cyber, terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace	4	10

	2	**Cyber Security Vulnerabilities and Cyber Security Safeguards** Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards-Overview,Accesscontrol,Audit,Authentication,Biometrics,Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	7	15
UNIT-II	3	**Securing Web Application, Services and Servers** Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	7	15
	4	**Intrusion Detection and Prevention** Intrusion, Physical Theft, Abuse of Privileges, Unauthorized	8	15
		Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation		
UNIT-I11	5	**Cryptography and Network Security** Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols:-security at the Application Layer-PGP and S/MIME, Security at Transport Layer-SSL And TLS, Security at Network Layer-IPSec.	8	15
	6	**Cyber space and the Law** Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyber space, Cyber Security Standards. The INDIAN Cyber space, National Cyber Security Policy 2013.	8	15
UNITIV	7	**Cyber Forensics** Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.	8	15

References:

1. Digital Privacy and Security Using Windows: A Practical Guide By Nihad Hassan, Rami Hijazi, Apress

2. Cyber Crime Investigation, DSCI-Nasscom,2013.

3. Information Systems Security: Security Management, Metrics, Frameworks And Best Practices (WithCd):Nina Gobole

4. Information systems control and Audit by Ron Weber, Pearson Pub.

5. Information security policies, procedures and standards by Thomas Pettier.

6. Information security Management Handbook-5thEdition-HAROLDF.TIPTON

7. Computer security by Alfred Basta, Wolf Halton

8. Information security policies-Thomas R. Peltier, Pel

Branch: M.Sc.(C.S.)	SEMESTER-I
Subject Code: PG1.6.2	Lecture:04 Credit: 04
Subject Title	Elective-I: Digital Image Processing

COURSEOBJECTIVES:

1. To introduce the fundamental problem so digital image processing (DIP).
2. To introduce the main concepts and techniques used to solve those.
3. To enable participants to implement solutions for reasonably complex problems, and to apply those to images.
4. To enable participants to understand basic DIP methodology that is discussed in the image processing literature, and applications of DIP across a broad range of scientific disciplines.
5. To motivate students to experience that DIP is a field where signal processing algorithms and methods become visual.

COURSEOUTCOMES:
After completion of course, students would be able to:
1. Understand image representation.
2. Enhance image quality using image enhancement techniques.
3. Filter given image using frequency domain filtering technique.
4. Select the right image restoration technique to remove degradation from given image.
5. Represent image using minimum number of bits using image compression.
6. Understand image segmentation technique.
7. Do morphological operations on given image.

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weigh tage%
UNIT-I	1	**Digital Image Fundamentals:** Light,brightnessadaptionanddiscrimination,Humanvisu alsystem,Image as a 2D data, Image representation Gray scale and Color images, Image Sampling and quantization.	5	5
		Image enhancement and filtering in spatial domain: Intensity transformation functions: Contrast stretching, Thresholding, Image negative, Log transformation, Power-low	5	10
		transformation, Intensity level slicing and Bit-plane slicing. Image histogram, Histogram equalization process. Fundamentals of spatial filtering, Correlation and convolution, Spatial filtering mask for low pass filtering (smoothing) and high pass filtering (sharpening).		
UNIT-II	2	**Image filtering in the frequency domain:** Preliminary Concepts, Extension to functions of two variables, Image Smoothing, Image Sharpening, Homomorphic filtering,2D-DFT, 2DFFT, 2D-DCT, Fundamentals of 2D-wavelet transform, Image pyramids, sub-band coding.	5	10
		Image restoration: Reasons for image degradation, Model of image degradation/ restoration process, Noise probability density functions, Imagerestorationusingspatialfiltering(Meanfilters,Orders tatisticfilters and adaptive filters), Inverse Filtering, MMSE (Wiener)Filtering.	5	15
UNIT-III	3	**Color Image Processing:** Color Fundamentals, Color Models, Pseudo-color image processing.	5	15
		Image Compression: Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard, Wavelet based image compression.	5	15
	5	**Image Segmentation:** Edge based segmentation, Region based segmentation, Region split and merge techniques, Region growing by pixel aggregation, optimal thresholding.	5	15

| UNIT-IV | 6 | **Morphological Image Processing:** Basic morphological operations, Erosion, dilation, opening, closing, Structuring elements, Hit-or-Miss transform, Basic Morphological Algorithms: hole filling, Connected components, thinning, skeletons, Reconstruction by erosion and dilation. | 5 | 15 |

Text Book:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Third Edition, Pearson Education.

Reference Books:

1. Digital Image Processing, S Jayaraman, SEsakkirajan, TVeerakumar, TataMcGrawHill Publication.
2. Digital Image Processing, SSridhar, Oxford University Press.

Branch: M.Sc.(C.S.)	Semester-I
Subject Code: PG1.6.3	Lecture:04 Credit:04
Subject Title	Elective-I: SOFTWARE ENGINEERING

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weight age
UNIT-I	1	**Software Processes:** Processes projects and products, Component software processes, characteristics of a software process, software Development Process, project management process, software configuration management process, software configuration management process, and process management process.	8	15
	2	**Software requirement Analysis and Specification:** Software requirement, need for SRS, requirement process, problem analysis, analysis issues. Informal approach, structured analysis, object oriented modeling, other modeling approaches, prototyping, requirement specification, characteristics of an SRS, component of an SRS, specification languages, structure of requirement document validation requirement reviews, other method metrics, size measures, quality metrics.	8	15
UNIT-II	3	**Planning Software Project:** Cost estimation, uncertainties in cost estimation, building cost estimation models, on size estimation, COCOMO model, project scheduling, average duration estimation, project scheduling and milestones, staffing and personnel planning, ray leigh curve, personnel plan, team structure, software configuration management plans, quality assurance plans, verification and validation, project monitoring plans, risk management.	10	20

	4	**Coding** – programming practice, verification, size measures, complexity analysis, coding standards. Testing–fundamentals, white box testing, control structure testing, black box testing, basis path testing, code walk-throughs and inspection, testing strategies-Issues, Unit testing, integration testing, Validation testing, System testing.	08	15
UNIT-III	5	**Maintenance**-Overview of maintenance process, types of maintenance. Risk management: software risks-risk identification-risk monitoring and management. Project Management concept: People–Product-Process-Project.	8	15

UNIT-IV	6	**Project scheduling and tracking:** Basic concepts-relation between people and effort-defining task set for the software project-selecting software engineering task Software configuration management: Basics and standards User interface design-rules. Computer aided software engineering tools-CASE building blocks, taxonomy of CASE tools, integrated CASE environment.	08	20

Reference Books:
1. Presman Roger,Software, Engineering: A Practitioner's Approach Tata McGrawHill, New Delhi.
2. Jalote Pankaj, An Integrated Approach to Software Engineering Narosa,New Delhi
3. R. E. Fairly. Software Engineering Concepts.McGrawHill,Inc1985.
4. Poyce, Software Project Management, Addison-Wesly.
5. Sommer ville, Software Engineering, Addison-Wesly.

Branch: M.Sc.(C.S.)	SEMESTER-I
Subject Code: PG1.6.4	**Lecture: 04** **Credit: 04**
Subject Title	**Elective-I: ARTIFICIAL INTELLIGENCE**

COURSE OBJECTIVES:
Students will be able to
1. Understand fuzzy logic, ANN Model Curriculum of Engineering & Technology PG Courses [Volume-I] [354].
2. Understand GA & EP.

COURSE OUTCOMES:
Students will be able to-
1. Learn the concepts of biological foundations of artificial neural networks.
2. Learn Feedback networks and radial basis function networks and fuzzy logics.
3. Identify fuzzy and neural network.
4. Acquire the knowledge of GA.

Modules	Sr. No.	Topic and Details	No of Lectures Assigned	Marks Weight age %
UNIT-I	1	**Introduction:** Overview of AI, Importance of AI, History, related fields, Representation of Knowledge, Knowledge Base Systems, State Space Search Problem Characteristics of 8- Queens, Traveling Salesman, Missionary & Cannibals, Crypt, Arithmetic, Monkey Banana Problem, Tower of Hanoi and Block World.	8	16
UNIT-II	2	**Searching Methods:** Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth Limited Search, Depth First Iterative Deepening (DFID), Informed Search Methods: Greedy best first Search, A* Search, Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems: Hill climbing search Simulated annealing, Local beam search, Genetic algorithms. Adversarial Search: Games, Optimal strategies, The minimax algorithm, Alpha-Beta Pruning.	8	20
	3	**Predicate & Logic:** Representing simple facts in Logic -Computable functions in predicates, resolution – unification – forward vs. backward reasoning., Probabilistic reasoning – Bayes's Theorem – Certainty Factors– Demphster–Shafer Theory – Fuzzy, Sets, Reasoning with Fuzzy Logic, Natural Language Computation with Fuzzy Logic.	9	20
UNIT-III	4	**Structured Knowledge Representation:** Associative Networks, Semantic Nets, Frames Structures, Conceptual, Dependencies & Scripts, Learning – Concept of Learning – Learning Automata, Learning by induction. **Natural Language Processing:** Overview of Linguistics, Grammars and Languages, basic Parsing techniques, semantic analysis, and representation structures. Natural Language generation and Natural Language Systems.	11	24

Modules	Sr. No.	Topic and Details		
UNIT-IV	5	**Expert Systems:** Architecture – Need and Justification of Expert Systems –Knowledge acquisition and validation. Perception and Action, Real time search, perception, action, vision, robot architecture, Learning in Neural Networks – Applications – Hopfield Networks, Back propagation, Case Study - XCON, PROSPECTOR	9	20

Reference Books:

1. Introduction to AI and Expert Systems - Patterson.
2. Artificial Intelligence A Modern Approach- Stuart Rushell.
3. Artificial Intelligence - Rich E and Knight K.
4. Principles of Artificial Intelligence - Nilsson.
5. Artificial Intelligence – An Engineering Approach – Schalkoff R J.
6. Introduction to Expert System - Peter Jackson.
7. Artificial Intelligence – Janakiraman.

Branch: M.Sc.(C.S.)	Semester-I
Subject Code: PG1.7	Lecture:04 Credit:04
Subject Title	Minor Stream: RESEARCH METHODOLOGY

Modules	Sr. No.	Topic and Details	No. of Lectures Assigned	Marks Weight age
UNIT-I	1	Research methodology: An Introduction Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques Involved in Defining a Problem.	4	08
	2	Research Design Need for Research Design, Features of Good Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Steps in Sampling Design, Types of Sampling Design, Sampling Fundamentals, Estimation, Sample size Determination, Random sampling.	6	12
UNIT-II	3	Measurement and Scaling Techniques Measurement in Research, Measurement Scales, Sources in Error, Techniques of Developing Measurement Tools, Scaling, Meaning of Scale, Scale Construction Techniques.	10	20
	4	Methods of Data Collection and Analysis Collection of Primary and Secondary Data, Selection of appropriate method Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of skewness, Regression Analysis, Correlation.	8	18
UNIT-III	5	Techniques of Hypotheses, Parametric or Standard Tests Basic concepts, Tests for Hypotheses I and II, Important parameters limitations of the tests of Hypotheses, Chi-square Test, Comparing Variance, As a non-parametric Test, Conversion of ChitoPhi, Caution in using Chi-square test.	12	24

| UNIT-IV | 6 | Analysis of Variance and Co-variance ANOVA, One way ANOVA, Two Way ANOVA, ANOCOVA Assumptions in ANOCOVA, Multivariate Analysis Technique Classification of Multivariate Analysis, factor Analysis, R-type Q Type factor Analysis, Path Analysis | 10 | 20 |

Reference books:

1. "Research Methodology", C.R. Kothari, Wiley Eastern.
2. "Formulation of Hypothesis",Will kinson K. P, L Bhandarkar, Hymalaya Publication, Bombay.
3. "Research in Education", John WBest andV. Kahn,PHI Publication.
4. "Research Methodology-A step by step guide for beginners", Ranjit Kumar, Pearson
5. "Management Research Methodology-Integration of principles, methods and Techniques",K.N.Krishna swami and others, Pearson Education

Semester-II

Branch: M.Sc.(C.S.)	Semester-II
Subject Code: PG2.1	Lecture:04 Credit:04
Subject Title	DATA WAREHOUSING AND DATAMINING

Modules	Sr. No.	Topic Details	No. of Lectures Assigned	Marks Weight age
UNIT-I	1	**Data Warehousing:** **Overview And Concepts:** Need for dataware housing, Basic elements of dataware housing, Trends in datawarehousing.	2	08
	2	**Planning And Requirements:** Project planning and management, Collecting the requirements.	2	
	3	**Architecture And Infrastructure:** Architectural Components, Infrastructure and metadata.	4	16
	4	**Data Design And Data Representation:** Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data Quality.	4	
UNIT-II	5	**Information Access And Delivery:** Matching information to classes of users, OLAP in data warehouse, Data warehousing and the web.	4	16
	6	**Implementation And Maintenance:** Physical design process, data warehouse deployment, growth and Maintenance.	4	
	7	**Data Mining:** **Introduction:** Basics of data mining, related concepts, Data mining techniques.	4	16
	8	**Data Mining Algorithms:** Classification, Clustering, Association rules.	4	
	9	**Knowledge Discovery:** KDD Process **Web Mining:** Web Content Mining, Web Structure Mining, Web Usage mining.	6	