Approved by the Hon'ble Vice-Chancellor dated 04.07.2018

Syllabus

M.Sc (CS) I - I Semester

(From the admitted batch of 2018 – 2019 under CBCS Scheme)

University College of Engineering
AdikaviNannaya University
Rajamahendravaram – 533 296

ADIKAVI NANNAYA UNIVERSITY

Master of Science in Computer Science(MSc CS)

Course Structure and Scheme of Valuation wef 2018-19 Admitted Batch

I Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS101	DISCRETE MATHEMATICAL STRUCTURES	4	-	75	25	100	4
MSCS102	DESIGN AND ANALYSIS OF ALGORITHMS	4	-	75	25	100	4
MSCS103	COMPUTER ORGANIZATION AND ARCHITECTURE	4	-	75	25	100	4
MSCS104	COMPUTER NETWORKS	4	-	75	25	100	4
MSCS105	OPERATING SYSTEMS	4	-	75	25	100	4
MSCS106	COMPUTER NETWORKS LAB	-	3	50	50	100	2
MSCS107	OPERATING SYSTEMS LAB	-	3	50	50	100	2
					Total	**700**	**24**

II Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS201	FORMAL LANGUAGES AND AUTOMATA THEORY	4	-	75	25	100	4
MSCS202	ARTIFICIAL INTELLIGENCE	4	-	75	25	100	4
MSCS203	DATA WAREHOUSING AND DATA MINING	4	-	75	25	100	4
MSCS204	RELATIONAL DATABASE MANAGEMENT SYSTEMS	4	-	75	25	100	4
MSCS205	ADVANCED JAVA PROGRAMMING	4	-	75	25	100	4
MSCS206	RDBMS LAB	-	3	50	50	100	2
MSCS207	ADVANCED JAVA PROGRAMMING LAB	-	3	50	50	100	2
MSCS208	MOOC	-	3	-	50	50	2
					Total	**700**	**24**

MOOC: PYTHON/DEVOPS/PHP/C#/DIGITAL FORENSICS

III Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS301	INFORMATION SECURITY AND CRYPTOGRAPHY	4	-	75	25	100	4
MSCS302	DATA SCIENCE WITH R	4	-	75	25	100	4
MSCS303	OBJECT ORIENTED SOFTWARE ENGINEERING	4	-	75	25	100	4
MSCS304	ELECTIVE-I	4	-	75	25	100	4
MSCS305	ELECTIVE-II	4	-	75	25	100	4
MSCS306	R LAB	-	3	50	50	100	2
MSCS307	OOSE LAB	-	3	50	50	100	2
MSCS308	MINI PROJECT	-	3	-	50	50	2
					Total	**700**	**24**

ELECTIVE-I: SOFTWARE TESTING AND QUALITY ASSURANCE / INTERNET OF THINGS / IMAGE PROCESSING

ELECTIVE-II: CLOUD COMPUTING / SOFT COMPUTING / MOBILE COMPUTING

IV Semester

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS401	PROJECT WORK	-	-	100	100	200	12

Course Structure

M.Sc. (1st Year – 1st Semester)
(2018-2019 Admitted Batch)

Code	Name of the subject	Periods/week		Max Marks		Total Marks	Credits
		Theory	Lab	External	Internal		
MSCS101	DISCRETE MATHEMATICAL STRUCTURES	4	-	75	25	100	4
MSCS102	DESIGN AND ANALYSIS OF ALGORITHMS	4	-	75	25	100	4
MSCS103	COMPUTER ORGANIZATION AND ARCHITECTURE	4	-	75	25	100	4
MSCS104	COMPUTER NETWORKS	4	-	75	25	100	4
MSCS105	OPERATING SYSTEMS	4	-	75	25	100	4
MSCS106	COMPUTER NETWORKS LAB	-	3	50	50	100	2
MSCS107	OPERATING SYSTEMS LAB	-	3	50	50	100	2
					Total	**700**	**24**

DISCRETE MATHEMATICAL STRUCTURES (MSCS 101)

Theory	**: 4 Periods**	**Mid Marks**	**: 25**
Lab Hrs	**: 0 Periods**	**Ext. Marks**	**: 75**
Exam	**: 3 Hrs.**	**Credits**	**: 4**

Unit I

Sets, relations and functions: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction. Permutations and combinations; recurrence relation and generating functions.

Unit II

Algebraic structures and morphisms: Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups.

Algebraic structures with two binary operations, Lattices, Principle of Duality, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions, Propositional Calculus.

Unit III

Mathematical logic: Syntax, semantics of Propositional and predicate calculus, valid, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments.

Proof techniques: forward proof, proof by contradiction, contrapositive proofs, proof of necessity and sufficiency.

Unit IV

Graph Theory: Graphs and digraphs, Eulerian cycle and Hamiltonian cycle, adjacency and incidence matrices, vertex colouring, planarity.

Trees: Introduction of trees, Applications of trees, Tree traversal, Spanning trees, minimum spanning trees

Text Book

1. J. P. Tremblay and R. P. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, 2001.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill.
2. C. L. Liu, Elements of Discrete Mathematics, 2nd Edition, Tata McGraw-Hill, 2000.

DESIGN AND ANALYSIS OF ALGORITHMS (MSCS 102)

Theory	**: 4 Periods**	**Mid Marks**	**: 25**
Lab Hrs	**: 0 Periods**	**Ext. Marks**	**: 75**
Exam	**: 3 Hrs.**	**Credits**	**: 4**

UnitI

Introduction: Fundamentals of algorithmic problem solving, important problem types, fundamental data structures.

Fundamentals of analysis of algorithms and efficiency: Analysis framework, Asymptotic Notations and Basic Efficiency classes, Mathematical Analysis of Non-recursiveAlgorithms, Mathematical Analysis of recursive Algorithms, Empirical Analysis of Algorithms, Algorithm Visualization.

Brute Force: Selection Sort and Bubble sort, Sequential Search and Exhaustive Search.

UnitII

Divide-and-Conquer: Merge Sort, Quick sort, Binary Search, Binary Tree Traversals and Related Properties. Decrease-and-Conquer: Insertion Sort, Depth-First Search and Breadth-First Search-Topological Sorting, Decrease-by-a-Constant-Factor Algorithms, Variable-Size-Decrease Algorithms. Transform-and-Conquer: Presorting, Balanced Search Trees, Heaps and Heap sort, Problem Reduction.

UnitIII

Space and Time Tradeoffs: Sorting by Counting, Hashing, B-Trees.Dynamic Programming: Warshall's and Floyd's Algorithm, Optimal Binary Search Trees, The Knapsack Problem and Memory Functions. Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees

UnitIV

Limitations of Algorithm Power: Lower-Bound Arguments, Decision Trees, P, NP and NP-complete problems.Coping with the Limitations of Algorithms Power: Backtracking, Branch-and-Bound, Approximation Algorithms for NP-hard Problems.

Text Book:

1. Introduction to Design & Analysis of Algorithms by AnanyLevitin, Pearson Education, New Delhi, 2003

Reference Books:

1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ron ald R. Rivest& Clifford Stein, Prentice Hall of India, New Delhi.
2. The Design and Analysis of computer Algorithms, Aho, Hopcroft& Ullman, Pearson Education, New Delhi, 2003
3. Fundamentals of algorithms, Gilles Brassard & Paul Bratley, Prentice Hall of India, New Delhi

COMPUTER ORGANIZATION AND ARCHITECTURE(MSCS 103)

Theory	**: 4 Periods**	**Mid Marks**	**: 25**
Lab Hrs	**: 0 Periods**	**Ext. Marks**	**: 75**
Exam	**: 3 Hrs.**	**Credits**	**: 4**

Unit I

Basic Structure of computers: Computer types,Functional units,Basic Operational concepts,Bus Structures, Software,Performance,Multiprocessors and Multi-computers,Historical perspective,Machine Instructions and Programs,Memory locations and Addresses,Memory Operations,Instructions and Instruction sequencing,Addressing modes,Assembly language,basic input and output operations,stacks and queues,Subroutines,Additional instructions,Example programs,Encoding of Machine Instructions.

Unit II

Input/output/organization:Accessing I/O devices,Interrupts,Processor Examples,Direct Memory Access,Interface circuits,Standard I/O interfaces.The Memory system:some basic concepts,semiconductor RAM Memories,ROM memories,speed,size and cost,Cache Memories,Performance Considerations,Virtual Memories,Memory Management Requirements,Secondary Storage.Basic Processing Unit: Some fundamental concepts,Execution of Complete Instruction,Multiple Bus Organization,Hardwired control,Micro programmed control.

Unit III

Computer Peripherals:Input Devices,Output Devices,Serial Communication Links.Large Computer Systems:Forms of Parallel Processing,Array Processors,The structure of Multiprocessor, Interconnection networks,Memory organization in multiprocessors,Program parallelism and shared variables,Multicomputers.Logic circuits:Basic logic functions,Synthesis of Logic functions,Minimization of Logic,Synthesis with NAND and NOR gates,Practical implementation of Logic gates,Flip flops,Registers and shift registers,Counters,Decoders,Multiplexers,PLD,Sequential circuits.

Unit IV

Pipelining:Basic concepts,Data Hazards,Instruction Hazards,Influence on Instruction sets,Superscalar operation.Examples of Embedded Systems, Processor chips for embedded applications,A simple Microcontroller,The IA-32 Pentium example:Registers and Addressing,IA-32 Instructions,IA-32 Assembly language,Program flow control,Logic and shift /Rotate instructions,I/O Operations,Subroutines,other instructions,Program examples.

Text Book:

1. Computer Organization,carlhamacher,ZvonkoVranesic,Safwatzaky, McGraw Hill Publications

COMPUTER NETWORKS (MSCS 104)

Theory	**: 4 Periods**	**Mid Marks**	**: 25**
Lab Hrs	**: 0 Periods**	**Ext. Marks**	**: 75**
Exam	**: 3 Hrs.**	**Credits**	**: 4**

Unit I

Introduction to Computer Networks: Introduction, Network Hardware, Network Software, Reference Models, Data Communication Services & Network Examples, Internet Based Applications.

Data Communications: Transmission Media, Wireless Transmission, Multiplexing, Switching, Transmission in ISDN, Broad Band ISDN, ATM Networks

Unit II

Data Link Control, Error Detection & Correction, Sliding Window Protocols, LANs & MANs: IEEE Standards for LANs & MANs-IEEE Standards 802.2, 802.3, 802.4, 802.5, 802.6, High Speed LANs.

Design Issues in Networks: Routing Algorithms, Congestion Control Algorithms, Network Layer in the Internet, IP Protocol, IP Address, Subnets, and Internetworking.

Unit III

Internet Transport Protocols: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Quality of Service Model, Best Effort Model, Network Performance Issues.

Over View of DNS, SNMP, Electronic Mail, FTP, TFTP, BOOTP, HTTP Protocols, World Wide Web, Firewalls.

Unit IV

Network Devices: Over View of Repeaters, Bridges, Routers, Gateways, Multiprotocol Routers, Hubs, Switches, Modems, Channel Service Unit CSU, Data Service Units DSU, NIC, Wireless Access Points, Transceivers, Firewalls, Proxies.

Overview of Cellular Networks, Ad-hoc Networks, Mobile Ad-hoc Networks, Sensor Networks

Text Book:

1. Computer Networks, Andrews S Tanenbaum, Edition 5, PHI, ISBN: -81-203-1165-5
2. Data Communications and Networking, Behrouz A Frozen, Tata McGraw-Hill Co Ltd, Second Edition

References:

1. Computer networks, MayankDave, Cengage Publications.
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson.
3. Data and Computer communications 5th edition William stallingspearson publication

OPERATING SYSTEMS (MSCS 105)

Theory	**: 4 Periods**	**Mid Marks**	**: 25**
Lab Hrs	**: 0 Periods**	**Ext. Marks**	**: 75**
Exam	**: 3 Hrs.**	**Credits**	**: 4**

UnitI

Introduction: Definition of OperatingSystem, Types Of Operating Systems, Operating System Structures, Operating-System Services, System Calls, Virtual Machines, Operating System Design and Implementation,

Process Management: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple - Processor Scheduling. Thread Scheduling.

UnitII

Process Synchronization: The Critical Section Problem, Semaphores, And Classical Problems of Synchronization, Critical Regions, Monitors, Synchronization examples.

Deadlocks: Principles of Deadlocks, System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection & Recovery from Deadlocks.

UnitIII

Memory Management:Logical Versus Physical Address, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing

File System Implementation: Concept of a file, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers.

Mass-storage structure: overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

UnitIV

Protection:Goals andPrinciplesofProtection,Accessmatriximplementation,Access control, Revocation ofaccess rights.Case study: LINUX, Windows Operating Systems.

TextBook:

1. OperatingSystemPrinciplesbyAbrahamSilberschatz,PeterGalvin,GregGagne.Seventh Edition, Wiley Publication

Reference Books:

1. Operating Systems, William Stallings 5th Edition - PHI
2. Modern Operating Systems, Andrew S.Tanenbaum, , 2nd edition, 1995, PHI.
3. Operating Systems - A concept based approach, Dhamdhere, 2nd Edition, TMH, 2006.
4. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition,' Reilly, 2005.

COMPUTER NETWORKS LAB (MSCS 106)

Theory	**:0 Periods**	**Mid Marks**	**: 50**
Lab Hrs	**: 3 Periods**	**Ext. Marks**	**: 50**
Exam	**: 3 Hrs.**	**Credits**	**: 2**

1. IdentifyingwellknownportsonaRemoteSystem:
   Bytryingtolistentothevariouswellknownportsbyopeningclientconnections.Ifthe exceptiondoesnotoccurthentheremoteportisactiveelsetheremoteportisinactive.

2. WritingaChatapplication:
   a. One-One:Byopeningsocketconnectionanddisplayingwhatiswrittenbyonepartyto theother.
   b. Many-Many(Broadcast):Eachclientopensasocketconnectiontothechatserverand writestothesocket.Whateveriswrittenbyonepartycanbeseenbyallotherparties

3. DataretrievalfromaRemotedatabase:
   AttheremotedatabaseaserverlistensforclientconnectionsThisserveracceptsSQLqueriesfromt heclient,executesitonthedatabaseandsendstheresponsetotheclient.

4. MailClient:
   i. POPClient:Givestheservername,usernameandpasswordretrievethemailsand allowmanipulationofmailboxusingPOPcommands.
   ii. SMTPClient:Givestheservername,sende-mailtotherecipientusingSMTPcommands- (CoreJava2pg:163.)

5. SimulationofTelnet:
   Provideauserinterfacetocontactwell-knownports,sothatclient-serverinteractioncan beseenbytheuser.

6. Simplefiletransferbetweentwosystems(withoutprotocols):
   Byopeningsocketconnectiontoourserverononesystemandsendingafilefromone systemtoanother.

7. TFTP-Client:
   TodevelopaTFTPclientforfiletransfer.(UnixNetworkprogramming-Stevens.)

8. HTTP-Server:
   DevelopaHTTPservertoimplementthefollowingcommands.
   GET,POST,HEAD,DELETE.Theservermusthandlemultipleclients.

ReferenceBooks:

1.AnIntroductiontoComputerNetworking,KennethC.MansfieldJrandJamesL.AntonakosPe arsonEducationAsia
2.JavaNetworkProgramming,Harold,Orielly

OPERATING SYSTEMS LAB (MSCS 107)

Theory	**:0 Periods**	**Mid Marks**	**: 50**
Lab Hrs	**: 3 Periods**	**Ext. Marks**	**: 50**
Exam	**: 3 Hrs.**	**Credits**	**: 2**

List of Experiments:

1. Basic UNIX commands

Implement the following using Shell Programming

2. Input number even or odd
3. Count the number of lines in the input text
4. Print the pattern *

   ***

   *****
5. File encryption

Implement the following using C/C++/JAVA in UNIX Environment.

6. FCFS CPU scheduling algorithm
7. SJF CPU scheduling algorithm
8. Round Robin CPU scheduling algorithm
9. Priority CPU scheduling algorithm
10. Implement Semaphores
11. Sequential file allocation strategy
12. Indexed file allocation strategy
13. Bankers Algorithm for Dead Lock Avoidance
14. Algorithm for Dead Lock Detection
15. FIFO Page Replacement Algorithm
16. LRU Page Replacement Algorithm
17. LFU Page Replacement Algorithm

References:

1. OperatingSystemPrinciplesbyAbrahamSilberschatz,PeterGalvin,GregGagne.Seventh Edition, Wiley Publication
2. Understanding the Linux Kernel, Daniel P Bovet and Marco Cesati, 3rd Edition, Reilly, 2005.
3. Unix programming, Stevens, Pearson Education.
4. Shell programming, YashwanthKanetkar.