UNIVERSITY OF JAMMU

(NAAC ACCREDITED A + GRADE UNIVERSITY)
Baba Sahib Ambedkar Road, Jammu-180006 (J&K)

NOTIFICATION

(20/Oct/Adp/39)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation of the approval of the Competent Bodies, has been pleased to authorize the adoption of Syllabi and courses of study of **Post-Graduate Programme in Engineering: Master of Technology in Computer Science and Engineering (M.Tech.) for Semester I to IV** under Credit Based System as given in the Annexure for the Examinations to be held in the years indicated against each Semester as under:-

Branch	Semester	For the Examination to be held in the years
Computer	**Semester-I**	**December 2020, 2021, 2022**
	Semester-II	**May 2021, 2022, 2023**
	Semester-III	**December 2021, 2022, 2023**
	Semester-IV	**May 2022, 2023, 2024**

The Syllabi of the course is available on the University Website: *www.jammuuniversity.ac.in.*

DEAN ACADEMIC AFFAIRS

6/10

No. F.Acd/III/20/2382-89
Dated: 6 /10/2020

Copy for information & necessary action to:-

1. Dean Faculty of Engineering
2. Principal, GCET/MIET
3. C.A to the Controller of Examinations
4. Assistant Registrar (Exams/Confidential)
5. Incharge University Website
6. Section Officer (Confidential)

ANNEXURE-I

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M. Tech 1st Semester Computer Science & Engineering

For Examinations to be held in the December 2020, 2021, 2022

Contact Hours/Week: 21

S.No	Subject Code	Subject	Teaching Hours/ Week			Credits	Marks	
			L	T	P		Internal	External
1	MCSE101	Research Methodology	3	-	-	3	25	75
2	MCSE102	Information Storage Management	3	-	-	3	25	75
3	MCSE103	Advanced Data Structures and Algorithms	3	-	-	3	25	75
4	MCSE104	Distributed Systems	3	-	-	3	25	75
5	MCSE105	Advanced Computer Networks	3	-	-	3	25	75
6	MCSE131	Software Laboratory- I	-	-	4	2	75	-
7	MCSE132	Advanced Computer Networks Laboratory	-	-	2	1	50	-
Total Credits						**18**	**250**	**375**

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Research Methodology
Course No.: MCSE101
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: Research Methodology is a hands-on course designed to impart education in the foundational methods and techniques of academic research in social sciences and business management context. Research scholars would examine and be practically exposed to the main components of a research framework i.e. problem definition, research design, data collection, ethical issues in research, report writing, and presentation. Once equipped with this knowledge, participants would be well-placed to conduct disciplined research under supervision in an area of their choosing. In addition to their application in an academic setting, many of the methodologies discussed in this course would be similar to those deployed in professional research environments.

Course Outcomes: By the end of the course students shall be able to:

CO101.1	To develop understanding of the basic framework of research process by exploring various research designs and techniques.
CO101.2	To identify various data collection, processing and analysis methods.
CO101.3	To develop an understanding of the ethical dimensions of conducting applied research.

Detailed Syllabus

Unit 1: Research Methodology: Introduction, Objectives of Research, Types of Research, Research Methods and Methodology, Defining a Research Problem, Techniques involved in Defining a Problem. **(06 hrs)**

UNIT 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. **(08 hrs)**

UNIT 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. **(07 hrs)**

UNIT 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. **(07 hrs)**

UNIT 5 : Techniques of Hypotheses: 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 Chi to Phi, Caution in using Chi-square test. **(07 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

1. C.R. Kothari, Wiley Eastern ,Research Methodology,
2. Willkinson K.P, L Bhandarkar ,Formulation of Hypothesis, Himalaya Publication, Bombay.
3. John W Best and V. Kahn ,Research in Education , PHI Publication
4. A. Lemley , Intellectual Property in New Technological Age , 2016.
6. Booth, Colomb and Williams,The Craft of Research, University of Chicago Press, Chicago & London, Second edition, 2003.
7. John W. Creswell. Research Design, Sage Publications, New Delhi, Third Edition, 2009.

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Information Storage Management
Course No.: MCSE102
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: This course provides a comprehensive introduction to Data Storage technology Fundamentals. Participants will gain knowledge of the core logical and physical components that make up a Storage Systems Infrastructure.

Course Outcomes: By the end of the course students shall be able to understand:

CO102.1	The explosion in demand from businesses for highly available and secure access to data.
CO102.2	The Storage systems and infrastructure architectures and solutions available to support business needs
CO102.3	The key tasks in successfully managing and monitoring a data storage infrastructure.

Detailed Syllabus

UNIT 1: Introduction: Meeting Today's Data Storage Needs, Value of data to business, Challenges in data storage and data management, List the solutions available for data storage. **(06 hrs)**

UNIT 2: Data Storage Solutions: Different media and available solutions to address data storage, Describe the role of each solution relative to data storage needs, Direct Attached Storage (DAS) environment, Network Attached Storage (NAS) environment, Storage Area Networks(SAN). **(07 hrs)**

UNIT 3: Data Centre Infrastructure: List the core elements of a Data Centre infrastructure, Describe the role of each element to support business activities, Requirements for storage systems to optimally support business activities, challenges and activities in managing storage systems in a data centre. **(08 hrs)**

UNIT 4 : Storage System Architecture: Logical components, file systems, volume management, Host Bus Adapters, key protocols and concepts used by each component, physical components of a connectivity environment , logical components of a connectivity environment, concept of RAID and components, Cache Structure and data flow through cache, cache algorithms. **(08 hrs)**

UNIT 5: Information Availability: Downtime, Business Continuity (BC) and Disaster Recovery (DR), Define RTO, RPO, and RGO, Database backup methods, Back Up Topologies for LAN and SAN based backups, local information availability, technologies within the data centre, potential areas of information vulnerability between local and remote data centres, Disaster Recovery. **(06 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- EMC Corporation, "Information Storage and Management: Storing, Managing, and Protecting Digital Information", Wiley, India, 2010
- Marc Farley, —Building Storage Networks‖, Tata McGraw Hill ,Osborne, 2001.
- Robert Spalding, —Storage Networks: The Complete Reference, Tata McGraw Hill, Osborne, 2003.

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Advanced Data Structures and Algorithms
Course No.: MCSE103
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: This course aims to provide the advanced methods of designing and analyzing algorithms and ability to choose appropriate algorithms and use it for a specific problem. It familiarizes students with basic paradigms and data structures used to solve advanced algorithmic problems and to understand different classes of problems concerning their computation difficulties.

Course Outcomes: By the end of the course students shall be able to:

CO103.1	Analyse the complexity/performance of different algorithms.
CO103.2	Determine the appropriate data structure for solving a particular set of problems and categorize them in various classes according to their complexity.
CO103.3	Gain an insight into the recent activities in the field of Advanced Data Structures.

Detailed Syllabus

UNIT 1: Role of Algorithms In Computing: Algorithms as a Technology, Insertion Sort ,Analyzing Algorithms, Designing Algorithms, Growth of Functions : Asymptotic Notation, Standard Notations and Common Functions, Recurrences: The Substitution Method, The Recursion Tree Method . **(08 hrs)**

UNIT 2: Hierarchical Data Structures: Binary Search Trees: Basics ,Querying a Binary search tree , Insertion and Deletion, Red-Black trees: Properties of Red-Black Trees , Rotations ,Insertion ,Deletion , B-Trees: Definition of B-Trees , Basic operations on B-Trees ,Deleting a key from a B-Tree, Fibonacci Heaps: structure , Merge-heap operations, Decreasing a key and deleting a node, Bounding the maximum degree. **(07 hrs)**

UNIT 3: Graphs: Minimum Spanning Trees: Growing a Minimum Spanning Tree , Kruskal and Prim, Single-Source Shortest Paths: The Bellman-Ford algorithm , Single-Source Shortest paths in Directed Acyclic Graphs, All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication ,Application of Cryptography to Blockchain , Using hash functions to chain blocks. **(08 hrs)**

UNIT 4: Algorithm Design Techniques: Dynamic Programming: Matrix-Chain Multiplication, Elements of Dynamic Programming, Longest Common Subsequence, Greedy Algorithms: An Activity Selection Problem , Elements of the Greedy Strategy, Huffman Codes. **(07 hrs)**

UNIT 5: NP Complete And NP Hard: NP-Completeness: Polynomial Time , Polynomial-Time Verification , NP-Completeness and Reducibility , NP-Completeness Proofs , NP-Complete Problems. **(06 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, —Introduction to Algorithms, Third Edition, Prentice-Hall, 2011.
- Ellis Horowitz and Sartaj Sahni, Fundamentals of Computer Algorithms- (second edition),Universities Press
- Robert Sedgewick and Kevin Wayne, Algorithms, Fourth Edition, Pearson Education.
- S.Sridhar, Design and Analysis of Algorithms, First Edition, Oxford University Press. 2014
- Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, —Data Structures and Algorithms, Pearson Education, Reprint 2006.

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Distributed Systems
Course No.: MCSE104
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: The course aims to provide an understanding of the principles on which the Internet and other distributed systems are based; their architecture, algorithms and how they meet the demands of contemporary distributed applications. The course covers the building blocks for a study of distributed systems, and addressing the characteristics and the challenges that must be addressed in their design: scalability, heterogeneity, security and failure handling being the most significant. This course also covers issues and solutions related to the design and the implementation of distributed applications.

Course Outcomes : By the end of the course students shall be able to:

CO104.1	Learn issues related to clock Synchronization and the need for global state in distributed systems when designing, implementing, and debugging distributed systems
CO104.2	Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
CO104.3	Compare replication schemes with respect to performance, availability, and consistency concerns

Detailed Syllabus

UNIT 1: Introduction: Definition , Relation to computer system components , Motivation , Relation to parallel systems , Message-passing systems versus shared memory systems ,Primitives for distributed communication ,Synchronous versus asynchronous executions , Design issues and challenges. A model of distributed computations: A distributed program , A model of distributed executions , Models of communication networks , Global state , Cuts , Past and future cones of an event , Models of process communications. Logical Time: A framework for a system of logical clocks , Scalar time , Vector time , Physical clock synchronization: NTP. **(08 hrs)**

UNIT 2: Message Ordering & Snapshots: Message ordering paradigms , Asynchronous execution with synchronous communication , Synchronous program order on an asynchronous system , Group communication, Causal order (CO) , Total order. Global state and snapshot recording algorithms: Introduction ,System model and definitions , Snapshot algorithms for FIFO channels. **(06 hrs) UNIT 3: Distributed Mutex & Deadlock:** Distributed mutual exclusion algorithms: Introduction , Preliminaries , Lamport's algorithm , Ricart-Agrawala algorithm , Maekawa's algorithm , Suzuki–Kasami's broadcast algorithm. Deadlock detection in distributed systems: Introduction , System model ,Preliminaries , Models of deadlocks , Knapp's classification, Algorithms for the single resource model, the AND model and the OR model. **(08 hrs) UNIT 4: Recovery & Consensus:** Check pointing and rollback recovery: Introduction, Background and definitions ,Issues in failure recovery ,Checkpoint-based recovery, Log-based rollback recovery, Coordinated check pointing algorithm ,Algorithm for asynchronous check pointing and recovery. Consensus and Agreement algorithms: Problem definition, Overview of results, Agreement in a failure–free system, Agreement in synchronous systems with failures **(07 hrs)**

UNIT 5: P2P & Distributed Shared Memory: Peer-to-peer computing and overlay graphs: Introduction , Data indexing and overlays , Chord , Content addressable networks , Tapestry. Distributed shared memory: Abstraction and advantages , Memory consistency models , Shared memory Mutual Exclusion. **(06 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
- Mukesh Singhal and Niranjan G. Shivaratri. Advanced concepts in operating systems. McGraw-Hill, Inc., 1994.
- Tanenbaum A.S., Van Steen M., —Distributed Systems: Principles and Paradigms‖, Pearson Education, 2007.
- Liu M.L., —Distributed Computing, Principles and Applications‖, Pearson Education, 2004.
- Nancy A Lynch, —Distributed Algorithms‖, Morgan Kaufman Publishers, USA, 2003.

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Advanced Computer Networks
Course No.: MCSE105
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: This course will cover the practical aspects of computer networks, with emphasis on the Internet. Various aspects of computer networking will be covered including: alternative link-layer, network-layer, and transport-layer technologies, LAN/WAN technologies, topologies, traffic analysis, congestion/flow control, routing, internetworking, multicast, security, and Quality of Service (QoS). The goal of this course is to introduce the students to state-of-the-art network protocols and architectures. We will introduce the students to networking research and guide them to investigate novel ideas in the area via semester-long research projects

Course Outcomes: By the end of the course students shall be able to:

CO105.1	Analyze different routing protocols and traffic engineering methods deployed in networking.
CO105.2	Understand the concept of SDN (i.e. abstracting and centralizing the control plane).
CO105.3	Analyze the implications of shifting from traditional network architectures to software defined networks

Detailed Syllabus

UNIT 1: Routing in Packet Networks: Shortest Path Routing; Traffic Management at packet level; Traffic management at flow level. **(06 hrs)**

UNIT 2: Advanced Network Architecture: Integrated Services in Internet, RSVP, Differentiated Services, MPLS, Real-time Transport Protocol . **(06 hrs)**

UNIT 3: Evolution of Switches and Control Planes: Cost, SDN Implications for Research and Innovation, Data Center Innovation, Data Center Needs, The Genesis of SDN: Abstract, The Evolution of Networking Technology, Forerunners of SDN, Software Defined Networking is Born, Sustaining SDN Interoperability, Open Source Contributions, Legacy Mechanisms Evolve Toward SDN, Network Virtualization, May I Please Call My Network SDN? How SDN Works: Abstract, Fundamental Characteristics of SDN, SDN Operation, SDN Devices, SDN Controller, SDN Applications, Alternate SDN Methods. **(08 hrs)**

Unit 4: SDN in the Data Center, Abstract, Data Center Definition, Data Center Demands, Tunnelling Technologies for the Data Center, Path Technologies in the Data Center, Ethernet Fabrics in the Data Center, SDN Use Cases in the Data Center, Open SDN versus Overlays in the Data Center, Real-World Data Center Implementations ; SDN in Other Environments : Abstract, Consistent Policy Configuration, Global Network View, Wide Area Networks, Service Provider and Carrier Networks, Campus Networks, Hospitality Networks, Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay Networks. **(08 hrs)**

Unit 5: Network Function Virtualization: Introduction, Existing Network Virtualization Framework (VMWare and others), Mininet based examples, Virtualization and Data Plane I/O, Services Engineered Path, Service Locations and Chaining, NFV at ETSI, Non-ETSI NFV Work, Network Topology and Topological Information Abstraction: Introduction, Network, Topology, Traditional Methods, LLDP, BGP-TE/LS, ALTO, I2RS Topology Building an SDN Framework. **(08 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions. Suggested Books:

- Communication Network by Alberto Leon Garcia and IndraWidjaja.
- SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies, By Thomas D. Nadeau, Ken Gray Publisher: O'Reilly Media, August 2013, ISBN: 978- 1-4493-4230-2, ISBN 10: 1-4493-4230-2.
- Software Defined Networks: A Comprehensive Approach, by Paul Goransson and Chuck Black, Morgan Kaufmann, June 2014, Print Book ISBN: 9780124166752, eBook ISBN : 9780124166844(unit 1)

Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Software Laboratory – I
Course No.: MCSE131

L	T	P	C	Internal
-	-	4	2	75

Course Outcomes: By the end of the course students shall be able to:

CO131.1	Compare and design efficient solutions for a given problem
CO131.2	Understand selection of data structure for an algorithm
CO131.3	Understand latest paradigms in Algorithm Design

Suggested Lab Exercises

1. Design, Develop and Implement a menu driven Program for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo

a. Create a SLL of N Students Data by using front insertion.

b. Display the status of SLL and count the number of nodes in it c. Perform Insertion and Deletion at End of SLL

d. Perform Insertion and Deletion at Front of SLL

e. Demonstrate how this SLL can be used as STACK and QUEUE

2. Design, Develop and Implement a Program for the following Stack Applications

a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks.

3.Write a program that implements a multi-thread application that hash tree threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number

4. Design, Develop and Implement a Program for the following operations on Singly Circular Linked List (SCLL) with header nodes

   a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3
   b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in

5. Given a File of N employee records with a set K of Keys(4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table(HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program that uses Hash function H: K ®L as H(K)=K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

6. How to read elements using Enumeration in hash table.

7. Design, Develop and Implement a menu driven Program for the following operations on Binary Search Tree (BST) of Integers

a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2

b. Traverse the BST in Inorder, Preorder and Post Order

c. Search the BST for a given element (KEY) and report the appropriate message

d. Delete an element (ELEM) from BST

e. Exit

8. Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

9. Implementation of making a change problem using dynamic programming.

10. Implementation of chain matrix multiplication using dynamic programming.

11. Implement N queen's problem using backtracking.

12. Implement 0/1 knapsack problem using dynamic programming.

13. Implement any schema to find the optimal solution for the travelling salesman problem and then solve the same problem in stance using any approximation algorithm and determine the error in the approx.

14. How to implement hash table so as to eliminate duplicate keys in it.

Note: Laboratory work will be evaluated on internal scheme with following components:

1. **Lab Work (Continuous Assessment) 70%**
2. **Viva-voce test 30%**

For Examinations to be held in the December 2020, 2021, 2022

Class: M.Tech 1st Semester
Branch: CSE
Course Title: Advanced Computer Networks Laboratory
Course No.: MCSE132

L	T	P	C	Internal
-	-	2	1	50

Course Outcomes: By the end of the course students shall be able to:

CO132.1	Identify and understand the various design issues of internetworking and routing protocols
CO132.2	Grasp the concepts and characteristics of various multicast routing protocol Architectures
CO132.3	Understand the working principles and design issues of transport layer protocols.

Suggested Lab Exercises:

1. Use network Simulator (NS2/NS3/NetSim/Omnet etc.).
2. Experiments related to routing protocols and transport layer protocols in various networks.
3. Experiments to include QoS attributes in various types of networks.
4. Explore current research trends in computer networks.

Note: Laboratory work will be evaluated on Internal scheme with following components:

1) **Lab. Work (Continuous Assessment) 70%**
2) **Viva-voce test 30%**

ANNEXURE-II

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M. Tech 2nd Semester Computer Science & Engineering

For Examinations to be held in the May 2021, 2022, 2023

Contact Hours/Week: 24

S.No	Subject Code	Subject	Teaching Hours/ Week			Credits	Marks	
			L	T	P		Internal	External
1	MCSE201	Artificial Intelligence and Machine Learning	3	-	-	3	25	75
2	MCSE21A MCSE21B	**Elective – 21** Software Quality Assurance and Testing Cryptography & Computer Security	3	-	-	3	25	75
3	MCSE22A MCSE22B	**Elective – 22** Cloud Computing Internet of Things (IoT)	3	-	-	3	25	75
4	MCSE23A MCSE23B	**Elective – 23** Big Data and Analytics Modeling and Simulation	3	-	-	3	25	75
5	MCSE231	Software Laboratory–II	-	-	6	3	100	-
6	MCSE232	Software Laboratory–III	-	-	4	2	75	-
7	MCSE213	Seminar – I			2	1	50	-
Total Credits						**18**	**325**	**300**

Remarks:

- The students will have an option to choose for Elective-21 between **A) Software Quality Assurance and Testing** and **B) Cryptography & Computer Security** as per approval of the department.
- The students will have an option to choose for Elective-22 between **A) Cloud Computing, Wireless Sensor Network** and **B) Internet of Things (IoT)** as per approval of the department.
- The students will have an option to choose for Elective-23 between **A) Big Data and Analytics and B) Modeling and Simulation** as per approval of the department.

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Artificial Intelligence and Machine Learning
Course No.: MCSE201
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: This course will survey the aspects of intelligence exhibited in biological systems and algorithmic approaches to mimic it. Material will include theoretical and applicative treatment of inductive learning, reinforcement learning, artificial neural networks and knowledge representation.

Course Outcomes: By the end of the course students shall be able to:

CO201.1	Design and implement intelligent solutions to classification, regression and clustering problems
CO201.2	Design and implement various Deep learning algorithms in a range of Real world applications.
CO201.3	Understand various Knowledge representation techniques.

Detailed Syllabus

UNIT 1: Introduction to Artificial Intelligence and Machine Learning: Basic questions of AI, history of AI , State of the art, Symbolic AI: Decision trees, symbolic computation (medical diagnosis), Generalization Theory, Statistical learning, sample complexity, proof of learnability of finite hypothesis class. **(08 hrs)**

UNIT 2: Optimization: Sample complexity of python programs , optimization SVMs / linear classification, The perceptron, margin, proof of convergence, mathematical optimization, convexity, introduction to convex analysis, constrained optimization, Gradient Descent , proof of convergence example: learning SVM with SGD, Stochastic optimization: Stochastic estimation of the gradient, stochastic gradient descent. **(08 hrs)**

UNIT 3: Introduction to Deep Learning: Deep nets, Non-convex optimization, Training via backpropagation algorithm, Neural nets for image recognition, Convolutional architectures, Deep nets, Regularization strategies. **(06 hrs)**

UNIT 4: Knowledge representation: Bayesian Networks: Definition of probabilistic Bayesian nets, Modelling via Bayes nets, Inferences, Markov Chain Monte Carlo: The sampling problem, simple sampling methods, Markov chains, stationarity, ergodicity, The MCMC algorithm, Hidden Markov Models: Temporal models, application to text tagging, Viterbi decoding algorithms. **(06 hrs)**

UNIT 5: Reinforcement learning: Game playing, Search, A* heuristic, Reinforcement learning, Markov Decision Process, Markov chains, Markov Reward processes, Ergodic theory reminder, Dynamic programming, The Bellman equation, value iteration, Policy iteration, Q-learning, function approximation, TD learning, policy gradient. **(08 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, 2015
- Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, 2014
- Artificial Intelligence: Strategies and techniques for complex problems solving by George Luger, Addison-Wesley, 2003.
- Artificial Intelligence - A Modern Approach by Stuart Russell & Peter Norvig, Prentice Hall.

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Software Quality Assurance and Testing
Course No.: MCSE21A
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: The production and use of quality software is critical to the survival of many projects and organizations. For the successful production of software, attention must be paid to quality during every phase of the development process. This course will describe the testing methods that can be used at each stage and will show how the testing processes form part of the overall quality assurance objectives for the organization.

Course outcomes: By the end of the course students shall be able to:

CO21A.1	Perform functional and non-functional tests in the life cycle of the software product.
CO21A.2	Understand system testing and test execution process and identify defect prevention techniques and software quality assurance metrics.
CO21A.3	Apply techniques of quality assurance for typical applications.

Detailed Syllabus

UNIT 1: Software Testing - Concepts, Issues and Techniques Quality Revolution, Verification and Validation, Failure, Error, Fault and Defect, Objectives of Testing, Testing Activities, Test Case Selection , White Box and Black test Planning and design, Test Tools and Automation, Power of Test, Test Team Organization and Management, Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building. **(06 hrs) UNIT 2:** System Testing: System Testing, System Integration Techniques: Incremental, Top Down, Bottom Up, Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration, Built-in Testing, Functional testing :Testing a Function in Context, Boundary Value Analysis, Decision Table, Acceptance testing : Selection of Acceptance Criteria, Acceptance Test Plan, Execution Test, software reliability : Fault and Failure, Factors Influencing Software, Reliability Models . **(08 hrs) UNIT 3:** System Test Categories: Taxonomy of System Tests, Interface Tests, Functionality Tests, GUI Tests, Security Tests, Feature Tests, Robustness Tests, Boundary Value Tests, Power Cycling Tests ,Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests, Test Generation from FSM models: State-Oriented Model, Finite-State Machine, Transition Tour Method, Testing with State Verification,
Test Architectures: Local, distributed, Coordinated, Remote, system test design . **(08 hrs)**

UNIT 4: Software Quality: People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria Relationship, Quality Metrics, Quality Characteristics ISO 9000:2000, Software Quality Standard, Maturity models: Test Process Improvement, Testing Maturity Model. **(06 hrs)**

UNIT 5: Software Quality Assurance: Quality Assurance - Root Cause Analysis, Modelling, technologies, standards and methodologies for defect prevention; Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees, Comparing Quality Assurance Techniques and Activities,

QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement, Case Study: FSM-Based Testing of Web-Based Applications. **(08 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc,2008
- Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
- Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004
- Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Cryptography and Computer Security
Course No.: MCSE21B
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Outcomes: By the end of the course students shall be able to:

CO21B.1	Understand basic design principals of symmetric and asymmetric cryptography and learn how standard cryptanalytic attacks work and thereby how to avoid common design flaws.
CO21B.2	Understand hash functions and existing techniques like Advanced Encryption Standard(AES), Rivest–Shamir–Adleman (RSA) and Discrete Log.
CO21B.3	Gain knowledge of the technologies that underpin the deployment and maintenance of a secure network.

Detailed Syllabus

UNIT 1: Introduction: Security mind-set, Computer Security Concepts (CIA), Threats, Attacks and Assets. **(05 hrs)**

UNIT 2: Cryptographic Protocols: Introduction to Protocols, Communications using Symmetric Cryptography, Substitution Ciphers and Transposition Cipher, Block Cipher, Steam Cipher, Modes of Operation, Symmetric and Asymmetric cryptography. **(06 hrs)**

UNIT 3: Cryptographic Techniques: Key Length & Management : Symmetric Key Length, Public-Key Key Length, Comparing Symmetric and Public-Key Key Length, Generating Keys, Algorithms: DIFFIE-HELLMAN, RSA, DES. **(08 hrs)**

UNIT 4: Practical Cryptography: Encryption, Authentication, Hashing, Symmetric and Asymmetric cryptography, Digital Signatures and Certificates. **(08 hrs)**

UNIT 5: Network Security and Protocol Standards : Network security issues, sniffing, IP Spoofing, Common threats, E-mail security, Secure Socket Layer (SSL), Transport Layer Security (TLS), SSH, IPSEC, Pretty Good Privacy (PGP), Intruders, Virus, Worms, Firewalls : need and features of firewall, Types of firewall, Intruder Detection Systems. **(08 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Introduction to Modern Cryptography by Jonathan Katz and Yehuda Lindell, CRC Press Cryptography and Network Security by William Stallings, Fourth Edition, 2006 Prentice Hall. ISBN 0-13-187316-4
- Handbook of Handbook of Applied Cryptography by Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, CRC Press.
- Applied Cryptography: Protocols, Algorithms and Source Code in C by Bruce Schneier, John Wiley and Sons

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE

Course Title: Cloud Computing
Course No.: MCSE22A
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: The course introduces the principles of distributed and parallel computing underlying cloud architectures and specifically focuses on virtualization, thread programming, task programming, and map-reduce programming. It explains how to make design choices and tradeoffs to consider when building applications to run in a virtual cloud environment.

Course Outcomes: By the end of the course students shall be able to:

CO22A.1	Install and configure various Cloud computing environments like Hadoop/AWS etc.
CO22A.2	Understand deployment of service and its usage over cloud by implementing Para-Virtualization using VM Ware's Workstation/ Oracle's Virtual Box and Guest O.S
CO22A.3	Implement Concurrent computing techniques to manage cloud resources efficiently.

Detailed Syllabus

UNIT 1: Distributed Systems: Virtualization, Web Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development. **(06 hrs)**

UNIT 2: Principles of Parallel and Distributed Computing: Eras of Computing, Parallel vs. Distributed Computing, Elements of Parallel Computing, Parallel Processing, Hardware Architectures for Parallel Processing, Approaches to Parallel Programming, Levels of Parallelism, Laws of Caution, Elements of Distributed Computing, General Concepts and Definitions, Components of a Distributed System, Architectural Styles for Distributed Computing, Models for Inter-Process Communication, Technologies for Distributed Computing, Remote Procedure Call, Distributed Object Frameworks, Service Oriented Computing. **(08 hrs)**

UNIT 3: Introduction to Virtualization: Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Case Studies: Xen(Paravirtualization), VMware(Full Virtualization), Microsoft(Hyper-V) . **(06 hrs)**

UNIT 4: Cloud Computing Architecture: Cloud Definition, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds(Public, Private, Hybrid and Community), Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance, Security, Trust, and Privacy, Organizational Aspects. **(08 hrs)**

UNIT 5: Concurrent Computing and High-Throughput Computing: Thread Programming, Introducing Parallelism for Single Machine Computation, Programming Applications with Threads, Threads, Thread APIs, Techniques for Parallel Computation with Threads, Domain Decomposition: Matrix Multiplication, Functional Decomposition: Sine, Cosine, and Tangent, Task Programming, Task Computing, Characterizing a Task, Computing Categories, Frameworks for Task Computing, Task-based Application Models, Embarrassingly Parallel Applications, Parameter Sweep Applications, MPI Applications, Workflow Applications with Task Dependencies, Task Programming Model, Developing Applications with the Task Model, Developing Parameter Sweep Application, Managing Workflows. **(08 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Rajkumar Buyya , Christian Vecchiola, S Thamarai Selvi, —Mastering Cloud Computing, McGraw Hill, Reprint 2006.
- T. Velte, A. Velte, R. Elsenpeter, Cloud Computing, A Practical Approach, McGraw-Hill, 2009
- Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011
- Jurg Van Vliet and Flavia Paganelli, Programming Amazon EC2, O'Rielly, 2011

- **FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023**

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Internet Of Things
Course No.: MCSE22B
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: This course covers the development of core technology, applications, sensors used and IOT architecture along with the industry perspective. Principles and operations of different types of sensors commonly used on mobile platform will be taught in a manner that by the end of the course the students will be able to design and implement real time solutions using IOT.

Course Outcomes: By the end of the course students shall be able to:

CO22B.1	Understand the concept of IOT
CO22B.2	Study IOT architecture and applications in various fields
CO22B.3	Understand various applications of sensor in Industrial, healthcare, commercial, and building automation.

Detailed Syllabus

UNIT 1: Introduction to IOT : What is IoT, how does it work? Difference between Embedded device and IoT device, Properties of IoT device, IoT Ecosystem, IoT Decision Framework, IoT Solution Architecture Models, Major IoT Boards in Market , Privacy issues in IOT. **(07 hrs)**

UNIT 2: Optimization Communication Protocols used in IoT: Types of wireless communication, Major wireless Short-range communication devices, properties, comparison of these devices (Bluetooth, Wireless Fidelity(WiFi), ZigBee, Low-power Wireless Personal Area Network(6LoWPAN)), Major wireless Long-range communication devices, properties, comparison of these devices (Cellular IoT, Low-Power Wide-Area Network(LPWAN)). **(07 hrs)**

UNIT 3: Building IoT With Raspberry Pi & Arduino: Explore Raspberry Pi, setting up Raspberry Pi, showing working of Raspberry Pi using Secure Shell (SSH) Client and Team Viewer, Understand Sensing actions, Understand Actuators and Micro electromechanical Systems (MEMS**).** **(07 hrs)**

UNIT 4: Sensors: Applications of various sensors: Google Maps, Waze, WhatsApp, Ola Positioning sensors: encoders and accelerometers, Image sensors: cameras Global positioning sensors: Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), Indian Regional Navigation Satellite System (IRNSS), Galileo and indoor localization systems, Motion & Orientation Sensors: Accelerometer, Magnetometer, Proximity Sensor, Gyroscope, Calibration, - noise modelling and characterization and - noise filtering and sensor data processing, Privacy & Security**.** **(08 hrs)**

UNIT 5: Case Studies And Real-World Applications: Industrial Internet 4.0, Applications such as: Smart Homes, Wearables, Smart City, Smart Grids, Connected Car, Connected digital health, telehealth, telemedicine), smart retail. **(07 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", VPT, 1st Edition
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications, 1st Edition
- CunoPfister, "Getting Started with the Internet of Things", OReilly Media
- Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer International Publishing

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Big Data and Analytics
Course No.: MCSE23A
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: This course brings together several key information technologies used in manipulating, storing, and analyzing big data. The course focuses on mining of massive data sets and machine learning algorithms for analyzing very large amounts of data or Big data The course reviews MapReduce techniques for parallel processing and Hadoop, an open source framework that allows us to cheaply and efficiently implement MapReduce on Internet scale problems. The course touches on related tools that provide SQL-like access to unstructured data: Pig and Hive and also analyzes so-called NoSQL storage solutions exemplified by HBase for their critical features: speed of reads and writes, data consistency, and ability to scale to extreme volumes. The memory resident databases and streaming technologies are analyzed.

Course Outcomes: By the end of the course students shall be able to:

CO23A.1	Understand the need for Big Data Analytics using Big Data tools like Hadoop & Spark etc.
CO23A.2	Gain the knowledge to use, and build practical big data analytics and management systems.
CO23A.3	Gain insight into the issues and problems involved in massive on-line repository systems

Detailed Syllabus

UNIT 1: Hadoop (Implementation specific) Need for Big Data Analytics, Big data tools: Hadoop & Spark ,Introduction to Hadoop ,Setting up Hadoop Development Environment ,HDFS – Concepts and Installation, Components of Hadoop, Understanding & Developing MapReduce Programs . **(07 hrs)**

UNIT 2: Hadoop Architecture Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering – Monitoring & Maintenance. **(07 hrs) UNIT 3:** Data Analytics LifeCycle Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders. **(06 hrs) UNIT 4**: Mining of Massive Data Sets Utilizing Data Structures and Algorithm, Modeling Graphs, Shortest path algorithm, Friends-of-friends, Page Rank, Bloom filters, Data Analytics ,Understanding the data analytics project life cycle, Understanding data analytics problems, Big Data Analysis ,Introduction to machine learning, Supervised machine-learning algorithms like Classification, Unsupervised machine learning algorithm like Clustering and Recommendation algorithms, Searching & Indexing, Inverted Index generation, Web crawling, Elastic search, In-link graphs . **(08 hrs) UNIT 5:** Big Data Frameworks Hadoop Ecosystem, Advanced MapReduce Techniques, Relational View with Hive,

Programming with Pig, Programming with Ooz, Programming with HBase & Zookeeper ,Cloud Deployment, Case Studies, Spark Framework, Introduction To Spark, Programming Spark using Python, Programming with SparkSQL.

(07 hrs)

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Jimmy Lin and Chris Dyer, Data-Intensive Text Processing with MapReduce, Morgan & Claypool Publishers, 2010. http://lintool.github.com/MapReduceAlgorithms/
- Chuck Lam, Hadoop in Action, December, 2010 | 336 pages ISBN: 9781935182191, Manning Publications
- Peter Zecevic and MarKo Bonaci, Spark in Action, 2017 | 476 pages, ISBN: 9781617292606, Manning Publications
- Anand Rajaraman and Jeff Ullman, Mining of Massive Datasets, Cambridge Press, http://infolab.stanford.edu/~ullman/mmds/book.pdf.
- Mohammed Guller, Big Data Analytics with Spark, Apress, 2015.

- **FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023**

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Modelling and Simulation
Course No.: MCSE23B
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: The course will introduce the basic concepts of computation through modelling and simulation that are increasingly being used by architects, planners, and engineers to shorten design cycles, innovate new products, and evaluate designs and simulate the impacts of alternative approaches.

Course outcomes: By the end of the course students shall be able to:

CO23B.1	Understand different methods for random number generation
CO23B.2	Have a clear understanding of the need for the development process to initiate the real problem.
CO23B.3	Have a clear understanding of principle and techniques of simulation methods informed by research direction.

Detailed Syllabus

UNIT 1 : Concepts of systems: Concepts of systems, Models and Simulation, Distributed Lag Model, Cobweb Models, The process of a simulation-Study, Exponential Growth Models, Exponential Decay Models, Type of simulation; Discrete Event Simulation : Time-Advance Mechanisms, Components and Organization of a Discrete Event Simulation Model; Monte Carlo Method. Simulation of Single-Server Queuing System, Simulation of an Inventory System.**(08 hrs)**

UNIT 2: Continuous Simulation: Continuous Simulation: Pure-pursuit Problem, Random Number Generators: Linear Congruential Generators, Other kinds of Generators, Testing Random Number Generators, Generating Random Variates : General Approaches, Continuous and Discrete distributions. **(07 hrs)**

UNIT 3: Introduction to GPSS: Introduction to GPSS, General Description, GPSS block-diagram, Simulation of a Manufacturing Shop, SNA, Function, Simulation of a Supermarket, GPSS Model of a Simple Telephone system. **(07 hrs)**

UNIT 4 : Output Data Analysis for a Single System: Output Data Analysis for a Single System: Transient and Steady-State Behavior of a Stochastic Process, Type of Simulations with regard to output Analysis and Statistical Analysis for Testing Simulation, Verification and Validation of Simulation. An introduction of different types of simulation languages. **(07 hrs)**

UNIT 5: Simulations Results Analysis and Viewing Tools: Display Forms: Tables, Graphs, and Multidimensional Visualization, terminals, X and MS Windows and Web Interfaces, validation of Model Results. **(06 hrs**)

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- G.Gorden, “System Simulation”, Pearson Education
- Law and Kelton, “Simulation Modeling and Analysis”, McGraw Hill
- N.Deo,”System Simulation with Digital Computer”, Prentice Hall of India
- Fred Maryanski, “Digital Computer Simulation”, CBSPD

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Software Laboratory – II
Course No.: MCSE231

L	T	P	C	Internal
-	-	6	3	100

Course Overview: In this course the students will be able to appreciate cloud architecture, create and run virtual machines on open source OS, implement Infrastructure, storage as a Service, install and appreciate security features for cloud.

Course Outcomes: By the end of the course students shall be able to:

CO231.1	Install and configure various Cloud computing environments like Hadoop /AWS. etc.
CO231.2	Understand deployment of service and its usage over cloud
CO231.3	Implement Para-Virtualization using VM Ware's Workstation/KVM.

Suggested Lab Exercises:

1. Study of Cloud Computing & Architecture.
2. Virtualization in Cloud using KVM, VMware
3. Study and implementation of Infrastructure as a Service using OpenStack
4. Study and installation of Storage as Service
5. Implementation of identity management using identity management feature of OpenStack
6. Write a program for web feed
7. Study and implementation of Single-Sing-On
8. Securing Servers in Cloud using own Cloud
9. User Management in Cloud using own Cloud
10. Case study on Amazon EC2
11. Case-study on Serverless architecture of AWS
12. Case study on Microsoft azure.

Note: Laboratory work will be evaluated on internal scheme with following components:

1. **Lab. Work (Continuous Assessment) 70%**
2. **Viva-voce test 30%**

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Software Laboratory - III
Course No.: MCSE232

L	T	P	C	Internal
-	-	4	2	75

Course Overview: In this course the students will be able to have clear understanding about the concepts of programming in python and familiarize themselves on various Free and Open Source Softwares (such as Scilab, Hadoop, Weka and Network Simulators ets.)

Suggested Lab Exercises: Students can choose a topic of their choice and perform a case study on recent advancements in that field. Some examples are shown below:

Case Studies:

- Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm.
- Data Science: Pharmaceutical Robot Scientist, Data Science for Drug Discovery and sensors data.
- Use network simulators (NS2/NS3/NetSim etc.). Enhance any routing or mac layer protocol to provide quality of service metrics to VoIP or Video traffic.

Note: Laboratory work will be evaluated on internal scheme with following components:

1. **Lab. Work (Continuous Assessment) 70%**
2. **Viva-voce test 30%**

FOR EXAMINATIONS TO BE HELD IN THE MAY 2021, 2022, 2023

Class: M.Tech 2nd Semester
Branch: CSE
Course Title: Seminar – I
Course No.: MCSE213

L	T	P	C	Internal
-	-	2	1	50

Course Overview: The course aims to expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions. To promote and develop presentation skills and import a knowledgeable society.To set the stage for future recruitment by potential employers.

Course Outcomes: By the end of the course students shall be able to acquire:

CO213.1	Ability to work in actual working environment.
CO213.2	Ability to utilize technical resources.
CO213.3	Ability to write technical documents and give oral presentations related to the work completed.

General guidelines for Presentation and File:

Content: Report must contain abundant material clearly related to topic; points should be clearly made and all evidence must support the topic along with varied use of materials.

Coherence and Organization: Topic should be clearly stated and developed; specified examples must be incorporated that would clearly develop the concept; conclusion must be clear and must flow well together.

Multimedia Material used: Report should have a balanced use of multimedia materials to properly showcase the work done.

Note: Seminar will be evaluated on internal scheme with following components:

1. **Presentation : 30% of total Internal Marks**
2. **Viva-Voce : 30% of total Internal Marks**
3. **Report : 40% of total Internal Marks**

ANNEXURE-III

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M. Tech 3rd Semester Computer Science & Engineering
For Examinations to be held in the December 2021, 2022,2023

Contact Hours/Week: 26

S.No	Subject Code	Subject	Teaching Hours/ Week			Credits	Marks	
			L	T	P		Internal	External
1	**MCSE31A** **MCSE31B**	**Elective – 31** Mobile and Pervasive Computing Digital Image Processing	3		-	3	25	75
2	**MCSE32A** **MCSE32B**	**Elective – 32** Cyber Security Multimedia and Virtual Reality	3		-	3	25	75
3	**MCSE312**	Dissertation –I			20	10	150	-
Total Credits						**16**	**200**	**150**

Remarks:

- The students will have an option to choose for Elective-31 between **A) Mobile and Pervasive Computing** and **B) Digital Image Processing** as per approval of the department.
- The students will have an option to choose for Elective-32 between **A) Cyber Security** and **B) Multimedia and Virtual Reality** as per approval of the department

For Examinations to be held in the December 2021, 2022,2023

Class: M.Tech 3rd Semester
Branch: CSE
Course Title: Mobile and Pervasive Computing
Course No.: MCSE31A
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: This course aim is to introduce the latest concepts of computing applications in pervasive computing, and the important mechanisms and methods for development and design of high performance pervasive computing systems. The topics to be covered are divided into four main areas: systems issues, architectures and tools; positioning, mobility and mobile data management; context-aware and proactive computing; and sensors and embedded computing.

Course outcomes: By the end of the course students shall be able to:

CO31A.1	Introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing.
CO31A.2	Illustrate architecture and protocols in pervasive computing and give practical experience in the area through the design and execution of a modest.
CO31A.3	Evaluate critical design tradeoffs associated with different mobile technologies, architectures.

Detailed Syllabus

Unit 1 : Introduction: Introduction to mobile computing, Adaptability in mobile computing, mechanism for adaption, support to build adaptive applications, applications of mobile computing. **(07 hrs) Unit 2 :** Data Dissemination: Challenges, Data dissemination, Mobile data caching, cache consistency, performance and architectural issues, Mobile Cache management techniques, broadcasting invalidation report, handling disconnection, energy and bandwidth efficiency algorithms. **(07 hrs) Unit 3 :** Ad Hoc Networks: Introduction to Ad Hoc networks, routing issues, Body, Personal, and Local Ad Hoc Wireless Networks, Multicasting Techniques in Mobile Ad Hoc Networks, Quality of Service in Mobile Ad Hoc Networks, Power-Conservative Designs in Ad Hoc Wireless Networks, Energy efficient algorithms for routing in Ad Hoc networks, clustering techniques, Coding for the Wireless Channel, Unicast Routing Techniques for Mobile Ad Hoc Networks, Position Based Routing in Ad Hoc Wireless Networks. **(08 hrs) Unit 4 :** Sensor Networks: Introduction to sensor networks, Data aggregation and data dissemination techniques in sensor networks, localization in sensor networks, Energy saving issues for Wireless Sensor, Broadcast Authentication and Key Management for Secure Sensor Networks, Embedded Operating Systems for Wireless Micro sensor Nodes, Time Synchronization and Calibration in Wireless Sensor Networks, The Wireless Sensor Network MAC, Topology Construction and Maintenance in Wireless Sensor Networks. **(08 hrs) Unit 5 :** Security in Ad Hoc and Sensor Networks: Basic concepts of cryptography, Key generation and management techniques, D-H algorithm, DES, Algorithms for key generation and distribution, overhead issues in key management w.r.t. mobile clients, Hashing techniques. **(05 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Sandeep K Gupta, Frank Adelstein, Golden G. Richard, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing: TMH
- Alan Colman, Jun Han, and Muhammad Ashad Kabir, Pervasive Social Computing Socially-Aware Pervasive Systems and Mobile Applications, Springer, 2016.
- J.Schiller, —Mobile Communication‖, Addison Wesley, 2000.
- Juha Korhonen, —Introduction to 4G Mobile Communications‖ , Artech House Publishers, 2014
- Kolomvatsos, Kostas, Intelligent Technologies and Techniques for Pervasive Computing, IGI Global, 2013.
- M.Bala Krishna, Jaime Lloret Mauri, —Advances in Mobile Computing and Communications: Perspectives and Emerging Trends in 5G Networks‖, CRC 2016
- Minyi Guo, Jingyu Zhou, Feilong Tang, Yao Shen, — Pervasive Computing: Concepts, Technologies and Applications ‖ CRC Press, 2016

For Examinations to be held in the December 2021, 2022,2023

Class: M.Tech 3rd Semester
Branch: CSE
Course Title: Digital Image Processing
Course No.: MCSE31B
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: This course provides a comprehensive introduction to digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.

Course Outcomes: By the end of the course students shall be able to:

CO31B.1	Understand image formation for the acquisition of images.
CO31B.2	Get knowledge of existing algorithms for the processing of digital images.
CO31B.3	Apply knowledge/skills to solve industrial problems based on image processing.

Detailed Syllabus

Unit 1: Introduction and Digital Image Fundamentals: Application of Image Processing, Image Processing definition, steps in Image Processing, Image Sensing and Acquisition, Image Sampling and Quantization, Spatial and Intensity, resolution-Effect of reducing spatial resolution, DPI, Effect of reducing image gray levels; Basic relationships between pixels and adjacency. **(06 hrs)**

Unit 2: Intensity Transformation and Spatial Filtering: Basics of intensity transformation and spatial filtering, intensity transformation functions-image negative, log transformation, power law; Piecewise-linear transformation functions-contrast stretching, intensity level slicing, bit plane slicing; Histogram Processing-histogram stretching, histogram equalization, Spatial Filtering, Spatial Correlation and Convolution, Smoothing Spatial Filters, order statistic filters, Sharpening Spatial Filters- The Laplacian, The Gradient-Robert cross gradient operator, Sobel operators. **(08 hrs)**

Unit 3: Image Restoration: Model of the image degradation/restoration process, Noise Models, Periodic Noise, Estimation of noise parameters, Restoration in the presence of noise-spatial filtering- Mean filters, Order-statistics filters, Median filter, Max and Min filters, Mid-point filter, Alpha-trimmed mean filter, adaptive filters. **(08 hrs)**

Unit 4: Color Image Processing: Introduction to the color image processing, color models: RGB, HSI, CMY/ CMYK; Conversion of color models: converting colors from RGB to HSI, HSI to RGB, RGB to CMY and CMY to RGB ; Pseudo coloring of images. **(06 hrs)**

Unit 5: Image Compression: Introduction to image compression, need of compression, methods of image compression: coding redundancy, spatial and temporal redundancy, irrelevant information, models of image compression, Huffman coding, Arithmetic coding, LZW coding, run-length coding, block transform coding, JPEG compression, predictive coding. **(07 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 3rd edition, Pearson Education.
- David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach", Prentice Hall
- A.K. Jain, "Fundamental of Digital Image Processing", PH

For Examinations to be held in the December 2021, 2022,2023

Class: M.Tech 3rd Semester
Branch: CSE
Course Title: Cyber Security
Course No.: MCSE32A
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course Overview: Fundamental security topics including cryptography, protocols, passwords, access control, software security, and network security. Additional topics selected from multilevel security, biometrics, tamper-resistant hardware, information warfare, e-commerce, penetrating testing, malware analysis, software security, system evaluation and assurance, and intrusion detection.

Course Outcomes: By the end of the course students shall be able to:

CO32A.1	Assess the security needs of computer and network systems,
CO32A.2	Recommend safeguard solutions and to manage the implementation and maintenance of security devices, systems, and procedures.
CO32A.3	Be knowledgeable in the major technical security challenges in each of the following four areas: cryptography, penetration testing, network security and software.

Detailed Syllabus

UNIT 1 : Information Assurance and the Secure Development Lifecycle: Foundations of Information Assurance (IA) and the Secure Development Lifecycle (SDL) needed to understand and apply best practices for development and on-going support of secure software systems in organizations; Confidentiality, availability, and integrity of information systems from hardware, software and network security; Secure Software Development : Secure design and secure coding principles, practices, and methods including least privilege, threat modelling, and static analysis; Common vulnerabilities such as buffer overruns, integer overflows, injection attacks, cross-site scripting, and weak error

handling. **(07 hrs) UNIT 2 :** Incident Response, Risk Management, Disaster Recovery: Risk management and incident response from an information assurance and cyber security perspective : risk management, risk assessments, threat, vulnerability and exploit analysis, risk prioritization, risk mitigation, business impact analysis, business continuity planning, disaster recovery planning, incident response and recovery, compliance and audits; Safeguarding operating systems and

related components such as operating systems, Active Directory and Group Policies. **(08 hrs) UNIT 3 :** Network and System Security: Examine the theory and practice of network security, the role of cryptography and the current state of the art secure networked systems : Access control, Authentication, Perimeter security defence, firewalls, virtual private networks, intrusion detection systems, and wireless security and network security

auditing tools. **(06 hrs) UNIT 4 :** Cyber Security and Threat Intelligence: Introduction to technical aspects of cyber security including threats and types of attacks against computers and networks, understanding and analyzing security requirements and defining security policies; Hands-on introduction to the concepts and tools of cyber threat intelligence: Cyber threat intelligence lifecycle, identifying, intelligence feeds, intelligence formats and standard cyber threat intelligence

technologies (e.g., CIF servers, TAXII servers, SIEM's). **(07 hrs) UNIT 5 :**Penetration Testing: Introduction to penetration testing (pen testing) or ethical hacking, full pen test life cycle; Knowledge of exploits, exploit avoidance, tools and methods used to compromise systems; Ethical hacking and penetration testing tools, vulnerability analysis and exploitation, defence techniques; Reconnaissance, OS fingerprinting, remote network mapping, web application, software and network vulnerabilities, attack surface analysis, fuzz testing, exploitation of vulnerabilities, credential gathering, and privilege escalation; Malware Analysis.

(07 hrs)

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

Suggested Books:

- Charles P. Pfellger, Security in Computing, Prentice Hall, Fourth Edn., 2006.
- Christian Collberg and Jasvir Nagra, Surreptitious Software, Addison-Wesley, First Edn., 2010.
- Mark Rodes, Ousley, Information Security: The Complete Reference, McGraw International, Second Edn., 2008
- William Stallings, Cryptography and Network Security, Prentice Hall, Fourth Edn, 2005
- Jon Erickson, Hacking: The Art of Exploitation, No Starch Press, Second Edn., 2008
- Rafey Baloch. Ethical Hacking and Penetration Testing Guide, CRC Press / T & F, 2015

For Examinations to be held in the December 2021, 2022,2023

Class: M.Tech 3rd Semester
Branch: CSE
Course Title: Multimedia and Virtual Reality
Course No.: MCSE32B
Duration Exam: 3 HRS

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

Course overview: This course addresses the field of virtual reality (VR) from the end-user's perspective. This course will present various rationale justifying the need for virtual reality (VR) and outline what VR can offer beyond traditional computer solutions. This course examines the features of VR technology and relates these features to specific applications. The course concentrates on identifying how VR can be applied to help solve today's science and engineering challenges and does not focus on exploring the various VR hardware and software products available on the market.

Course Outcomes: By the end of the course students shall be able to:

CO32B.1	Demonstrate an ability to do research by designing and conducting experiments, analyze and interpret multimedia data individually as well as part of multidisciplinary teams.
CO32B.2	Demonstrate an ability to design a system, component or process as per needs and specifications of the customers and society needs.
CO32B.3	Acquire an ability to prepare short films and documentaries to showcase their knowledge of multimedia tools.

Detailed Syllabus

UNIT 1 : Multimedia preliminaries and applications : Development and use of multimedia packages; Introduction to virtual reality and modelling languages; CD-ROM and the Multimedia Highway, Introduction to making multimedia :The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Motivation for multimedia usage; Frequency domain analysis, Application Domain & ODA ; Multimedia Hardware and Software: Multimedia Hardware – Macintosh and Window production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards. **(08 hrs)**

UNIT 2 : Multimedia building blocks Multimedia : Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects; Data Compression: Different algorithms related to text, audio, video and images ; Working Exposure on Tools like Dream Weaver, 3D Effects, Flash . **(06 hrs)**

UNIT 3 : Multimedia and the Internet : History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW : Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML; Designing for the WWW – Working on the web; Multimedia Applications: Media Communication, Media Consumption, Media Entertainment, Media games. **(07 hrs)**

UNIT 4 : Multimedia looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing content and talent, Delivering; CD-ROM technology. **(07 hrs)**

UNIT 5 : Virtual Reality : Introduction to Virtual reality & Virtual reality Systems, Related Technologies: Tele-operation & augmented reality system, VRML Programming, Domain Dependent Applications like Medical, Visualisation Visibility computation ,Time Critical rendering. **(07 hrs)**

Note: The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions. Suggested Books:

- Steve Heath, 'Multimedia and Communication Systems' Focal Press, UK.
- Tay Vaughan, 'Multimedia: Making it Work', TMH
- Keyes, 'Multimedia Handbook', TMH

For Examinations to be held in the December 2021, 2022,2023

Class M.Tech: 3rd Semester
Branch: CSE
Course Title: DISSERTATION-I
Course No.: MCSE312

L	T	P	C	Internal
-	-	20	10	150

Course overview: Research and development projects based on problems of practical and theoretical interest. Problem definition, background research, development of overall project plan. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories.

Note: Dissertation-1 will be evaluated on Internal scheme with following components:

1) **Performance or work done : 30% of total Internal marks**
2) **Seminar : 25% of total Internal marks**
3) **Viva : 25% of total Internal marks**
4) **Report : 20% of total Internal marks**

ANNEXURE-IV

UNIVERSITY OF JAMMU, JAMMU

Course Scheme

M. Tech 4th Semester Computer Science & Engineering

For Examinations to be held in the May 2022, 2023, 2024

Contract Hours/Week: 32

S.No	Subject Code	Subject	Teaching Hours/ Week			Credit	Marks	
			L	T	P		Internal	External
1	MCSE411	**Dissertation-II** (Students have to submit the final project report at the end of the semester which will be evaluated followed by a seminar, presentation and viva -voce examination.)	-	-	32	16	250	150
Total Credits						**16**	**400**	

For Examinations to be held in the May 2022, 2023, 2024

Class M.Tech: 4th Semester
Branch: CSE
Course Title: DISSERTATION-II
Course No.: MCSE411

L	T	P	C	Internal	External
-	-	32	16	250	150

Course overview: Research and development projects based on problems of practical and theoretical interest, Problem definition, background research, development of overall project plan. Evaluation will be based on student seminars, written reports, and evaluation of the developed system and/or theories.

At least one publication in a journal of repute is mandatory for the final evaluation of Dissertation.

Note: Dissertation-II will be evaluated for internal and external evaluation.

Internal evaluation will be done based on following components:

1. **Presentation/ Demonstration : 40% of total Internal marks**
2. **Report : 40% of total Internal marks**
3. **Viva-Voce : 20% of total Internal marks**