VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
9-5-81, Ibrahimbagh, Hyderbad-500031, Telangana State

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Course Structure
M.Tech I year

Semester-I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction					Scheme of Examination			Credits
			Periods per Week					Duration in Hrs	Maximum Marks		
			L	T	D	P			Univ. Exam	Sessionals	
		THEORY									
1.	CS 5010	Advanced Algorithms	4	-	-	-		3	70	30	3
2.	CS 5020	Advanced Operating Systems	4	-	-	-		3	70	30	3
3.	CS 5030	Artificial Intelligence	4	-	-	-		3	70	30	3
4.	CS 5040	Object oriented Software Engineering	4	-	-	-		3	70	30	3
5.		ELECTIVE-I	4	-	-	-		3	70	30	3
6.		ELECTIVE-II	4	-	-	-		3	70	30	3
7		Finishing School	2								1
		PRACTICALS									
1.	CS 5051	Software lab1(AA and OOSE)	-	-	-	3		-	-	50	3
2.	CS 5066	Seminar-I	-	-	-	3		-	-	50	2
		Total	**26**		**6**			**-**	**420**	**280**	**24**
		Grand Total	**32**						**700**		**24**

Elective I & Elective II

CS 5070 Mobile computing
CS 5080 Information Storage Management
CS 5090 Parallel Computer Architecture
CS 5100 Advanced Computer Graphics
CS 5110 Human computer interaction
CS 5120 Simulation modelling
CS 5130 Software project management
CS 5140 Embedded Systems
CS 5150 Reliability & fault tolerance

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Course Structure
M.Tech I year

Semester-II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction					Scheme of Examination			Credits
			Periods per Week					Duration in Hrs	Maximum Marks		
			L	T	D	P			Univ. Exam	Sessionals	
		THEORY									
1.	CS 5160	Distributed Computing	4	-	-	-		3	70	30	3
2.	CS 5170	Advance Databases	4	-	-	-		3	70	30	3
3.		ELECTIVE-III	4	-	-	-		3	70	30	3
4.		ELECTIVE-IV	4	-	-	-		3	70	30	3
5.		ELECTIVE-V	4	-	-	-		3	70	30	3
6.		ELECTIVE-VI	4	-	-	-		3	70	30	3
7		Finishing School	2	-	-	-		-			1
		PRACTICALS									
1.	CS 5181	Software labII (DC and ADB)	-	-	-	3		-		50	3
2.	CS 5196	Seminar-II	-	-	-	3		-		50	2
		Total	**26**		**6**			**-**	**420**	**280**	**24**
		Grand Total	**32**						**700**		**24**

Elective III & IV
CS 5200 Image processing
CS 5210 Data Mining
CS 5220 Machine learning
CS 5230 Soft Computing
CS 5240 Real time systems
CS 5250 Natural Language Processing
CS 5260 Neural Networks
CS 5270 Software Quality & testing
CS 5280 Parallel algorithms

Electives V & VI
CS 5290 Cloud Computing
CS 5300 Network Security
CS 5310 Information Retrieval Systems
CS 5320 Multimedia Technologies
CS 5330 Web Engineering
CS 5340 Software reuse techniques
CS 5350 Big data Analytics
CS 5360 Software Engineering For Real Time Systems
CS 5370 Web mining

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
Course Structure
M.Tech II year

Semester-III

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction					Scheme of Examination			Credits
			Periods per Week					Duration in Hrs	Maximum Marks		
			L	T	D	P			Univ. Exam	Sessionals	
1.	CS 5196	Dissertation + Project Seminar	-	-	-	6		-	-	100	6
		Total			**6**			**-**	**-**	**100**	**6**
		Grand Total			**6**					**100**	**6**

Department of Computer Science and Engineering
Course Structure
M.Tech II year

Semester-IV

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction					Scheme of Examination			Credits
			Periods per Week					Duration in Hrs	Maximum Marks		
			L	T	D	P			Univ. Exam	Sessionals	
1	CS 5205	Project Dissertation	-	-	-	6			*Grade		6
		Total			**6**						**6**
		Grand Total			**6**						**6**

*Grade : Excellent/Very good/Good/Satisfactory/Unsatisfactory

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester
Advanced Algorithms

Instruction : 4 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS 5010
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
Students should be able to analyze the asymptotic performance of algorithms and apply various algorithm design strategies to solve engineering problems	1. Analyze time and space complexity of algorithms 2. Describe the divide-and-conquer, Greedy, Dynamic programming, and explain when an algorithmic design situation calls for specific strategy. 3. Design and Analyze network flow, and number theoretic algorithms. 4. Design and analyze string, pattern matching, and geometric algorithms. 5. Differentiate between NP-complete, NP-Hard problems

UNIT-I :	**(14 Periods)** **Algorithm Analysis**: Asymptotic Notations, Amortization **Basic Data Structure**: Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tables **Search Trees and Skip Lists**: Ordered Dictionaries and binary Search Trees, AVL trees, Bounded-Depth Search Trees.
UNIT-II :	**(13 Periods)** **Fundamental Techniques:** The Greedy Method, Divide and Conquer, Dynamic Programming **Graphs**: The Graph abstract data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs.
UNIT-III :	**(8 Periods)** **Weighted Graphs**: Single Source Shortest Paths, All pairs Shortest Paths, Minimum Spanning Trees **Network Flow and Matching:** Flows and Cuts, Maximum Flow, Maximum Bipartite Matching, Minimum Cost Flow

UNIT-IV :	**(8 Periods)** **Text processing:** Strings and Pattern Matching algorithms, Tries, Text Compression, Text Similarity testing. **Number Theory and Cryptography:** Fundamental Algorithms involving numbers, Cryptographic Computations, Information Security Algorithms and Protocols.
UNIT-V :	**(5 Periods)** **Computational Geometry**: Range Trees, Priority Search Trees, Quad trees and k-d Trees, Convex Hulls. P, NP, NP-Complete, NP-Hard, cooks theorem, reducibility.
Learning Resources :	1. M.T.Goodrich, R.Tomassia, "Algorithm design – Foundations, Analysis, and Internet Algorithms", John Wiley, 2002 2. E Horrowitz, S salmi, S Rajasekaran, "Fundamentals of Computer Algorithms",Second Edition University Press, 2007. 3. Aho, A V craftHop Ullman JD ,"The Design and Analysis of Computer Algorithms",Pearson Education,2007. 4. Hari Mohan Pandy, " Design analysis and Algorithms", University Science Press, 2009 5. Thomas H. Cormen, Charles E. Lieserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, PHI,MIT press,USA, 2003

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester
Advanced Operating Systems

Instruction : 3 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS5020
Credits : 2	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students should be able to:***
1. Students should be able to describe different components of distributed operating system and design suitable algorithms for the better functionality of distributed operating system.	1. Discuss distributed operating system, architectures and issues in distributed operating systems. 2. Explain different distributed mutual exclusion algorithms and distributed deadlock algorithms. 3. Design distributed scheduling algorithm and describe distributed shared memory. 4. Explain failure recovery, fault tolerance and apply various cryptographic algorithms for the protection of given data. 5. Differentiate architectures of multiprocessor system and concurrency control algorithms.

UNIT-I :	**(9 Periods)** **Architecture of Distributed Systems:** Types, Distributed OS, Issues in Distributed Operating Systems, Theoretical Foundations: Global clock, Lamport's Logical clocks, Vector Clocks, Global State, Termination Detection.
UNIT-II :	**(14 Periods)** **Distributed Mutual Exclusion**: classification, requirement, performance, non-token based algorithms, Lamport's algorithms, the Ricart-Agrarwala algorithm, token based algorithm-Suzuki kasami's broadcast algorithm, Singhal's heuristic algorithm. **Deadlock Detection**: Resource Vs communication deadlock, A graph – theoretic model, prevention, avoidance, detection, control organization, centralized deadlock-detection algorithm, the completely centralized algorithm, the HO- Ramamoorthy algorithms. Distributed deadlock detection algorithm- path-pushing, edge-chasing, hierarchical deadlock detection algorithm, menasce-muntz and Ho-Ramamoorthy algorithm. Agreement protocols: The system model, the Byzantine agreement, the consensus problem.
UNIT-III :	**(11 Periods)** **Distributed File System**: Mechanisms, Design Issues **Case Studies**: Sun NFS, Sprite File System, DOMAIN, Coda File system **Distributed shared memory**: Algorithms for implementing DSM, Memory Coherence, Coherence Protocols, Design Issues. **Case Studies**: IVY, Mirage, Clouds **Distributed Scheduling**: Issues in Load Distribution, components of Algorithm, Stability, Load Distributing Algorithm, and Performance.

UNIT-IV :	**(11 Periods)** **Failure Recovery**: Backward, Forward Error Recovery in Concurrent Systems, consistent Set of Check Points, Synchronous and Asynchronous check Pointing and Recovery. **Fault Tolerance**: Commit protocols, Non-blocking Commit Protocols, Voting Protocols. **Protection and Security**: Access Matrix, Private Key, Public Key, Kerberos System.
UNIT-V :	**(12 Periods)** **Multiprocessor Operating Systems**: Motivation, Basic Multiprocessor System Architectures, Interconnection Networks for Multiprocessor Systems, caching, Hypercube Architecture. Threads, Process Synchronization, Processor Scheduling, memory management. **Database Operating System**: Concurrence Control, Distributed databases, Concurrency control Algorithms.
Learning Resources :	1. Singhal M, Shivaratri N.G., "Advanced concepts in Operating systems", McGraw Hill Intl., 1994 2. Pradeep K Sinha, "Distributed Operating Systems Concepts and Design", PHI, 2002 3. Andrew S Tanenbaum, "Distributed Operating System", Pearson Education India,2001

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester
Artificial Intelligence

Instruction : 4 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS5030
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students should be able to:***
Students will be able to identify and formulate solution using searching, reasoning, machine learning and natural language processing techniques to solve specific computer science problems.	1. Apply various search algorithms to solve a problem. 2. Differentiate knowledge representations such as Propositional Logic and Predicate Logic 3. Explain the various components of Expert systems and device a solution to the problem when the knowledge is uncertain using probabilistic theory. 4. Apply the machine learning paradigms to solve specific computer science problems. **5.** Discuss the linguistic knowledge representation for natural language processing and apply fuzzy set theory to deal with vague and imprecise knowledge.

UNIT-I :	**(14 Periods)** **Introduction :** History, Intelligent Systems, Foundation of AI, Sub areas of AI, Applications. **Problem Solving – State – Space Search and Control Strategies:** Introduction, General Problem Solving, Characteristics of problem, Exhaustive Searches, Heuristic Search Techniques, Iterative – Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look – Ahead Strategy and use of Evaluation Function, MINIMAX procedure, Alpha-Beta Pruning.
UNIT-II :	**(10 Periods)** **Logic Concepts and Logic Programming:** Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. **Knowledge Representation:** Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.
UNIT-III :	**(08 Periods)** **Expert System and Applications:** Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert System versus Traditional Systems, Truth

	Maintenance Systems, Application of Expert Systems, List of Shell and tools. **Uncertainty Measure – Probability Theory :** Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster – Shafer Theory.
UNIT-IV :	**(10 Periods)** **Machine – Learning Paradigms:** Introduction, Machine learning Systems, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees (Learning Resources: 2) Deductive Learning, Clustering, Support Vector Machines. **Artificial Neural Networks :** Introduction Artificial Neural Networks, Single – Layer Feed Forward Networks, Multi – Layer Feed Forward Networks, Radial – Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks
UNIT-V :	**(9 Periods)** **Fuzzy Sets and Fuzzy logic :** Fuzzy sets, Fuzzy set operations, Types of membership Functions, Multi valued logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy Propositions, Inference Rules for Fuzzy Propositions, Fuzzy Systems. **Advanced Knowledge representation Techniques:** Case Grammars **Natural Language Processing :** Introduction. Sentence Analysis Phases, Grammars and Parsers, Types of Parsers, Semantic Analysis, Universal Networking Knowledge
Learning Resources :	**Learning Resources:** 1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning, 2011. 2. Russell, Norvig," Artificial Intelligence, A Modern Approach ", Pearson Education, Second Edition, 2004. 3. Elaine Rich, Kevin Knight, Shivshankar B. Nair, "Artificial Intelligence", Tata McGraw Hill, Third Edition 2009.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester

Object Oriented Software Engineering

Instructions 4 periods / Week	Semester End Exam Marks : 70	Subject reference Code **CS5040**
Credits 3	Sessional Marks : 30	Duration Of End Semester Exam 3 Hrs.

COURSE OBJECTIVES	**COURSE OUTCOMES**
Students should be able to	***At the end of the course students should be able to:***
construct an efficient information system using Object Oriented programming concepts.	1. Define the software systems ,discuss different problems in software system development and solve these problems using Object Oriented concepts 2. Differentiate different fact finding techniques to capture the requirements and apply different methods for requirement analysis 3. Analyze the different Object Oriented Programming concepts and apply them in software system development **4.** Apply different design patterns in software system development to solve real world problems **5.** Discuss different methods for database design and different reusable components for software system developmen

UNIT-I :	**(11 Periods)** **Information System:** Problems in Information Systems, development, Project Life Cycles, Managing Information Systems Development, User Involvement and Methodological approaches, Basic Concepts and Origins of Object Orientation Modeling concepts.
UNIT-II :	**(9 Periods)** Requirement Capture, Requirement Analysis, Refining the Requirement Models, Object Interaction
UNIT-III :	**(14 Periods)** Operations, Control, Design, System Design**.**
UNIT-IV :	**UNIT-IV (12 Periods)** Object Design, Design patterns, Human Computer Interaction, Designing Boundary Classes. Testing concepts: Fault and Erroneous states and failures, Test Cases Testing activities: Component Inspection, Usability Testing, Unit Testing, Integration Testing ,system testing, Regression Testing, Model Based Testing.

UNIT-V :	**(11 Periods)** Data Management Design, Implementation, Reusable Components, Managing Object Oriented Projects, System Development Methodologies.
Learning Resources :	1. Simon Benett, Steve Mc Robb & ray Farmer, Object Oriented System Analysis and Design using UML, McGraw Hill, 2002 2. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Using UML, Patterns and Java, 2nd Edition, Pearson Education Asia 3. Grady Booch, James Rumbaugh, Ivor Jacobson, The Unified Modeling Language-User Guide, Addison Wesley, 1999. 4. Ivor Jacobson, Grady Booch, James Rumbaugh, The Unified Software Development Process, Addison Wesley, 1999

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester

SUB: MOBILE COMPUTING

Instruction : 4 Periods per week	Semester End Exam Marks: 70	Subject Reference Code: CS5070
Credits :3	Sessional Marks: 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Student should be able to:	***At the end of the course students will be able to:***
Describe the functionalities and protocols of Mobile Systems, design and develop mobile apps.	1. Describe the principles of Cellular wireless networks. 2. Explain GSM, GPRS, 3G technologies and broadcasting techniques. 3. Identify and choose Wireless LAN protocols for different environments. 4. Compare file systems for mobility support and discuss ways to publish data on air. 5. Design and develop mobile app and compare models of mobile transactions

UNIT-I :	**(11 Periods)** **Introduction:** Wireless Transmission, Frequencies for Radio Transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread Spectrum, MAC- SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.
UNIT-II :	**(11 Periods)** **Telecommunication Systems:** GSM, GPRS, Satellite Systems - Basics, Routing, Localization, Handover, FAMA and DAMA, Broadcast Systems- DAB, DVB, CDMA and 3G.
UNIT-III :	**(11 Periods)** **Wireless LAN:** IEEE 802.11, Architecture, Services, MAC-Physical Layer, IEEE 802.11a-802.11b Standards, Bluetooth.
UNIT-IV :	**(11 Periods)** **Mobile IP** - Dynamic Host Configuration Protocol, Traditional TCP- Classical TCP Improvements-WAP, WAP 2.0 **Publishing & Accessing Data in Air:** Pull and Push Based Data Delivery models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air

	File System Support for Mobility: Distributed File Sharing for Mobility Support, CODA and other Storage Manager for Mobility Support.
UNIT-V :	**(10 Periods)** **Mobile Platforms** - Android, iOS, Windows Phone 8, Mobile App or Website, Android Development Tools, Application Development, Android development practices **Mobile Transaction and Commerce:** Models for Mobile transaction, Kangaroo and Joey Transactions, Team Transaction. Recovery Model for Mobile Transactions, Electronic Payment and Protocols for Mobile Commerce.
Learning Resources :	1. Jochen, M Schiller, "Mobile Communications", 2nd Edition Pearson Education, 2009. 2. Jeff McWherter, Scott Gowell, "Professional Mobile Application Development", Wiley Publishers, 2012 3. KumkumGarg, "Mobile Computing",Pearson Education, 2010. 4. Asoke K Talukder,Roopa R Yavagal, "Mobile Computing",TMH, 2008. 5. Raj Kamal, "Mobile Computing", Oxford, 2009. 6. A Survey of Mobile Transactions appeared in Distributed and Parallel Databases, pgs. 193-230, Kluwer Academic Publishers,2004. 7. Balancing Push and Pull for Data Broadcast,S.Acharya, M.Franklin and S.Zdonik. Proceedings of ACM SIGMOD, Tuscon, AZ, May 1997. 8. Broadcast Disks: Data Management for Asymmetric Communication Environments, S.Acharya, R. Alonso, M.Franklin and S.Zdonik. Proceedings of ACM SIGMOD Conference San Jose, CA, May 1995.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester

INFORMATION STORAGE & MANAGEMENT

Instruction : 4 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS 5080
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
The students shall be able to apply the knowledge of different Storage techniques to practice scalable data universe generated by heterogeneous devices and devising a support system for a highly available self sustainable business solutions that are robust, secure & cloud enabled	1. Evaluate Storage architectures and key data center elements in classic, virtualized & cloud Environments, explain physical & logical components of storage infrastructure, RAID & Intelligent Storage Systems. 2. Describe storage networking technologies: FC-SAN, IP-SAN, FCoE, NAS, Object-based and unified storage. 3. Elaborate business continuity solutions, backup and recovery technologies, and local and remote replication solutions 4. Detail the various enabling technologies, service models & Adoption considerations in the area of cloud. 5. Define information security and storage security domains Identify parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions

UNIT-I :	**(10 Periods)** **Storage System** Introduction to information storage, virtualization and cloud computing, Key data center elements, Compute, application, and storage virtualization, Disk drive & flash drive components and performance, RAID, Intelligent storage system and storage provisioning (including virtual provisioning)

UNIT-II :	**(13 Periods)** **Storage Networking** Fibre Channel SAN components, FC protocol and operations, Block level storage virtualization, iSCSI and FCIP as an IP-SAN solutions, Converged networking option – FCoE, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform
UNIT-III :	**(16 Periods)** **Backup, Replication, Archive** Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection
UNIT-IV :	**(7 Periods)** **Cloud Infrastructure** Cloud Enabling Technologies, Characteristics of Cloud Computing, Benefits, Cloud Service Models, Deployment Models, Cloud Computing Infrastructure, Cloud Challenges, Cloud Adoption Considerations, Concepts in practice
UNIT-V :	**(11 Periods)** **Storage Security & Management** Security threats, and countermeasures in various domains, Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiering
Learning Resources :	**Suggested Reading** 1. Information Storage and Management, Somasundaram G, Alok Shrivastava, Second Edition, Wiley Publishers 2. Implementation Management and Security - John W. Rittinghouse, James F. Ransome, CRC Press 3.Storage Networks: The Complete Reference, Robert Spalding, Tata McGraw Hill, Osborne, 2003. **References** 1. Building Storage Networks, Marc Farley, Tata McGraw Hill, Osborne. 2001. 2. Storage Area Network Fundamentals, MeetaGupta, Pearson Education Limited, 2002.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester
SUB: SOFTWARE LAB-I
(Distributed Computing and Advanced Databases Lab)

Instruction : 3 Periods per week	Semester End Exam Marks: 50	Subject Reference Code: CS5051
Credits : 3		Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Student should be able to:	***At the end of the course students will be able to:***
Implement different algorithm to solve real world problems and design an Information system using UML	1. Implement Shortest path algorithm 2. Implement string search algorithms 3. Implement different network security algorithms 4. draw use case class diagrams using rational rose 5. draw Interaction diagrams for Information system using rational rose.

Experiments :	**(12 Periods)** **Algorithms:** 1. Shortest Path 2. Minimal Spanning Tree 3. String and pattern matching 4. Network Flow **OOSE:** A case study using case tool supporting UML Note: The students have to submit a report at the end of the semester.
Learning Resources :	1. Grady Booch, James Rumbagu, Ivor Jacobson, "The Unified Modeling Language-User guide", (Covering UML 2.0) 2nd Edition Pearson Education, India 2007.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– First Semester

Seminar-I

Instruction : 3 Periods perweek	Semester End Exam Marks : -	Subject Reference Code : CS5066
Credits : 2	Sessional Marks: 50	Duration of Semester End Exam : -

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
Students will acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	1. Improve presentation and communication skills. 2. Aware of recent advancements in industry and new research trends. 3. Collect information through literature survey, analyze and present them. 4. Acquire knowledge about new hardware and software needs of market. 5. Acquire technical document writing skills.

	Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization. Seminar topics can be chosen by the students with the advice from the faculty members. Students are to be exposed to following aspects of seminar presentation. Literature survey Organization of material Preparation of OHP slides / PC presentation Technical writing.

	Each student is required to Submit one page of synopsis of the seminar talk two days before for display on notice board. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion. Submit a report on the seminar topic with a list of references and slides used within a week. Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged. The Sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SUB: DISTRIBUTED COMPUTING

Instruction : 3 Periods per week	Semester End Exam Marks: 70	Subject Reference Code: CS5160
Credits :3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
Student should be able to:	***At the end of the course students will be able to:***
Describe the functionalities of Distributed Systems and demonstrate component technologies.	1. Explain the goals and design issues of distributed systems. 2. Demonstrate remote procedural call, remote method invocation and describemessage and stream oriented communication. 3. Describe design issues of server and naming entities in a distributed system. 4. Distinguish between CORBA, DCOM and GLOBE middleware. 5. Describe quality of service parameters in distributed multimedia systems.

UNIT-I :	**(09 Periods)** Introduction: Definition of Distributed Systems, Goals: Connecting Users and Resources, Transparency, Openness, Scalability, Hardware Concepts: Multiprocessors, Homogeneous Multicomputer systems, Heterogeneous Multicomputer Systems, Software Concepts: Distribute Operating Systems, Network Operating Systems, Middleware, The Client-Server Model: Clients and Servers, Application Layering, Client-Server Architectures.
UNIT-II :	**(12 Periods)** Communication: Layered Protocols: Lower-Level Protocols, Transport Protocols, Higher-Level Protocols, Remote Procedure Call: Basic RPC Operation, Parameter Passing, Extended RPC Models, Remote Object Invocation: Distributed Objects, Binding a Client to an Object, Static verses Dynamic Remote Method Invocations, Parameter Passing, Message Oriented Communication: Persistence and Synchronicity in Communication, Message-Oriented Transient Communication, Message-Oriented Persistent Communication, Stream Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization.

UNIT-III :	**(11 Periods)** Process: Threads: Introduction to Threads, Threads in Distributed Systems, Clients: User Interfaces, Client-Side Software for Distribution Transparency, Servers: General Design Issues, Object Servers, Software Agents: Software Agents in Distributed Systems, Agent Technology, Naming, Naming Entities: Names, Identifiers, and Address, Name Resolution, The Implementation of a Name System, Locating Mobile Entities: Naming verses Locating Entities, Simple Solutions, Home-Based Approaches, Hierarchical Approaches.
UNIT-IV :	**(13 Periods)** Distributed Object based Systems: CORBA: Overview of CORBA, Communication, Processes, Naming, Synchronization, Caching and Replication, Fault Tolerance, Security, Distributed COM: Overview of DCOM, Communication, Processes, Naming, Synchronization, Replication, Fault Tolerance, Security, GLOBE: Overview of GLOBE, Communication, Process, Naming, Synchronization, Replication, Fault Tolerance, Security, Comparison of CORBA, DCOM, and GLOBE: Philosophy, Communication, Processes, Naming, Synchronization, Caching and Replication, Fault Tolerance, Security.
UNIT-V :	**(07 Periods)** Distributed Multimedia Systems: Introduction, Characteristics of Multimedia Data, Quality of Service Management: Quality of Service Negotiation, Admission Control, Resource Management: Resource Scheduling.
Learning Resources :	1. Andrew S. Tanenbaum and Van Steen, "Distributed Systems", Pearson Education, 2002. 2. Colouris G. Dollimore Jean, Kindberg Tim, "Distributed Systems Concepts and Design", 3rd Edition Pearson Education, 2002.KumkumGarg, "Mobile Computing",Pearson Education, 2010.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SUB:Advanced Databases

Instruction : 3 Periods +1 Tutorial per week	Semester End Exam Marks : 70	Subject Reference Code : CS 5170
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
Student should be able to apply knowledge of advanced database management techniques to provide solution for a database intensive problem.	1. Create and query tables in object relational and object oriented databases. 2. Write and process an XML file for a given data. 3. Describe the steps involved in Query processing and optimization. 4. Explain inter query, intra query parallelism and distributed database processing techniques. 5. Describe performance tuning methods and representation of data in Temporal , Spatial and Geographical databases..

UNIT-I :	**(10 Periods)** **Object Based Databases:** Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.
UNIT-II :	**(11 Periods)** **XML:** Motivation, Structure of XML data, XML Document Schema, Querying and Transformation, Application program Interface to XML , Storage of XML application.
UNIT-III :	**(10 Periods)** **Query Processing:** Overview, Measures of Query Cost, Selection Operation, Sorting, Join ' Operation, Other Operations, Evaluation of Expressions. **Query Optimization:** Overview, Transformation of Relational Expressions, Estimating

	Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views.
UNIT-IV :	**(11 Periods)** **Parallel Databases:** Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems. **Distributed Databases :** Homogeneous and Heterogeneous Database, Distributed Data Storage, Distributed. Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems.
UNIT-V :	**(13 Periods)** **Advanced Application Development:** Performance Tuning, Performance Benchmarks Other Issues in Application Development, Standardization. **Spatial and Temporal Data and Mobility:** Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.
Learning Resources :	1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", McGrawHill international Edition, Sixth Edition, 2010. 2. Elmasri Navathe, Somayajulu, Gupta fundamentals ofDatab.ase Systems", Pearson Education, Fourth Edition, 2006. 3. CJ Date, A Karman, S Swamynathan, "An Introduction to Database Systems", Pearson Education, Eighth Edition, 2006. 4. Ramakrishna, Gehrke, "Database Management" International Edition, Third Edition, 2003.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SuB: IMAGE PROCESSING

Instruction : 3 Periods +1 Tutorial per week	Semester End Exam Marks: 70	Subject Reference Code : **CS 5200**
Credits : 3	Sessional Marks: : 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
store, enhance,segment, recognize, encode, and represent the images by spatial and frequency domain techniques.	1. Explain sampling and quantization processes in obtaining digital images from continuously sensed data and describe the steps in image processing 2. Apply Fourier tranformation and enhance digital image 3. Apply different techniques in spatial domain to enhance digital image 4. Describe different methods to encode raw image data into standard compressed image format 5. Explain most commonly applied color models and their use in basic color image processing.

UNIT-I :	**(10 Periods)** **Image formation & description:** Digital image representation – Elements of visual perception. Sampling & Quantization. Elements of digital image processing systems.
UNIT-II :	**(11 Periods)** **Image transforms:** Digital Image transforms – Fourier transform, Extension to 2D, DCT Walsh, Hadamard transforms.
UNIT-III :	**(10 Periods)** **Image enhancement & segmentation:** Histogram modification. Image smoothing – Image sharpening, Thresholding. Edge detection. Segmentation. Point and region dependent techniques.
UNIT-IV :	**(11 Perios)** **Image encoding:** Fidelity criteria. Transform compression. KL. Fourier, DCT, Spatial compression. Run length coding. Huffman coding. Contour coding.
UNIT-V :	**(13 Periods)** **Restroration:** Restroration models. Inverse filtering. Least squares Filtering. Recursive filtering
Learning Resources :	1. Gonzalex R. C. Woods R.E: Digital Image Processing, Addison Wesley, 1992. 2. Rosenfeld A. Kak AC: Digital Picture Processing Vol. I & II, Acad. Press, 2nd ed.1982. 3. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing and Analysis and Machine Vision, 2nd Edition, Thomson Learning, 1999.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SUB: Data Mining

Instruction : 3 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS5210
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hus

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
1. Analyze various data mining tasks to find relevant patterns from large databases	1. Explain the steps in KDD , Identify various pre-processing techniques and Compute similarity among objects and differentiate relational & multidimensional data models 2. Build a classification model to classify unknown data objects based on different classification techniques 3. Illustrate the use of advanced classification models for prediction 4. Find associations and correlations among items by mining frequent patterns from transactional databases 5. Evaluate clusters formed based on various clustering techniques

UNIT-I :	**(10 Periods)** Introduction: Challenges-Origins of Data Mining and Data Mining Tasks Data: Types of Data Quality-Data Preprocessing-Measures of Similarity and Dissimilarity OLAP and Multidimensional Data Analysis.
UNIT-II :	**(14 Periods)** Classification: Preliminaries-General Approach to Solving a Classification Problem-Decision Tree Induction-Model Over fitting-Evaluating the performance of a Classifier-Methods of Comparing Classifiers-Rule-Based Classifier.

UNIT-III :	**(12 Periods)** Classification: Nearest-Neighbor classifiers-Bayesian Classifiers-Artificial Neural Networks-Support Vector Machine-Ensemble Methods-Class Imbalance Problem-Multiclass Problem.
UNIT-IV :	**(10 Periods)** Association Analysis: Problem Definition-Frequent Item Set Generation-Rule Generation-Compact Representation of Frequent Item Sets-Alternative Methods for Generating Frequent Item Sets-FP-Growth Algorithm-Evaluation of Association Patterns-Effect of Skewed Support Distribution-Handling Categorical Attributes and Handling Continuous Attributes-Handling a concept Hierarchy.
UNIT-V :	**(9 Periods)** Cluster Analysis: Overview-K-means-Agglomerative Hierarchical Clustering-DBSCAN Cluster Evaluation on Characteristics of Data, Clusters, and Clustering Algorithms.
Learning Resources :	1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education.2008. 2.K.P.Soman, Shyam Diwakar, V.Ajay, "Insight into Data Mining Theory and Practice,PHI.2010. 3. Arun K Pujari, "Data Mining Techniques", University Press,2nd Edn,2009. 4. Vikram Pudi P.Radha Krishna, "Data Mining", Oxford University Press, Ist edition 2009. 5. S Sumathi, S N Sivanandam."Introduction to Data Mining and its Applications",Springer2006.

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SUB:CLOUD COMPUTING

Instruction : 4 Periods per week	Semester End Exam Marks : 70	Subject Reference Code : CS 5290
Credits : 3	Sessional Marks: : 30	Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES**
The course will enable the students to:	***At the end of the course students should be able to:***
To provide the students with an in-depth knowledge of Cloud Computing services, models, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, standards and implementations.	1. Correlate the evolution of hardware & software technologies that substantiated the rise of Cloud computing. 2. Identify the benefits of cloud computing service and deployment models and visualize the need for building cloud networks. 3. Elaborate cloud migration strategy, appreciate cloud implementation standards and evaluate the role of virtualization 4. Analyze the need for federation, threats associated with identity, privacy & security in cloud & recommend risk management policies & measurements 5. Explain the standards in cloud computing & showcase the end user examples that embrace cloud computing

UNIT-I :	**(11 Periods)** **The Evolution of Cloud Computing:** Hardware Evolution, Internet Software Evolution, Establishing a common Protocol for the Internet, Evolution of Ipv6, Finding a Common Method to Communicate Using the Internet Protocol, Building a Common Interface to the Internet, Cloud Formation- From One Computer to a Grid of Many, Server Virtualization, parallel Processing, Vector Processing, Symmetric Multiprocessing Systems, Massively Parallel Processing Systems.
UNIT-II :	**(13 Periods)** **Web Services and the Cloud:** Communication-as-a Service (CaaS), Infrastructure-as-a-

	Service (laaS), Monitoring-as-a-Service (MaaS), Platform-as-a-Service (PaaS), Software-NIS-a-Service(SaaS) **Building Cloud Networks:** The Evolution from the MSP Model to Cloud, Computing and Software- as-a-Service, The Cloud Data Centre, Collaboration, Service-Oriented Architectures as a Step Towards Cloud Computing, Basic Approach to a Data Center-Based SOA The Role of Open Source Software in Data Centers, Where Open Source Software is Used Case studies: Amazon web services, Google App Engine.
UNIT-III :	**(11 Periods)** **Virtualization:** Introduction, Types and Technologies, Accomplishing virtualization, importance of virtualization in Cloud computing. Case studies: Xen Virtual machine monitor – Xen API, VMware – VMware product – VMware Features, Microsoft Virtual Server – Features of Microsoft Virtual Server
UNIT-IV :	**(11 Periods)** Federation in the Cloud, Presence in the Cloud, Privacy and Its Relation to Cloud-Based Information System. Cloud Security Challenges, Software-as-a-Service Security, Security-as-a-Service the New MSSP.
UNIT-V :	**(8 Periods)** **Common Standards in cloud Computing:** The Open Cloud Consortium, The Distributed Management Task Force, Standards for Application Developers, Standards for Messaging, Internet Messaging Access Protocol (IMAP), Standard for Security **Examples of End-Use Access to Cloud Computing Mobile Internet Devices and the Cloud**: Mobile Operating Systems for Smartphones Mobile Platform Virtualization, Collaboration Applications for Mobile Platforms.
Learning Resources :	**Suggested Readings:** 1. Cloud Computing: Implementation, Management and Security John W. Rittinghouse, James F. Ransome. CRC Press 2009. 2. Virtualization Specialist level complete certification kit – Study guide from www.theartofservice.org. 3. Professional Xen Virtualization, William Von Hagen, Wrox Publications, January, 2008. 4. Virtualization: From the Desktop to the Enterprise, Chris Wolf, Erick M. Halter, APress 2005. 5. Advanced Server Virtualization: VMware and Microsoft Platform in the virtual Data Center, David Marshall, Wade A. Reynolds, Auerbach Publications. 2006 **Web resources:** 1. http://aws.amazon.com/ec2 http://code.google.com/appsengine

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Syllabus for M.Tech. – Second Semester

SUB: Network Security

Instructions 4 periods / Week	Semester End Exam Marks : 70	Subject reference Code **CS5300**
Credits 3	Sessional Marks : 30	Duration Of SEE 3 Hrs.

COURSE OBJECTIVES	COURSE OUTCOMES
	At the end of the course students will be able to:
Student should be able to apply different algorithms to achieve various security services	1. Discuss different security attacks and threats 2. Differentiate secrete Key cryptography and public key crypto graphy and discuss DES, AES and RSA algorithms for information security 3. Discuss and differentiate different methods for message integrity and authentication 4. Discuss PKI Interface and differentiate different methods for smart card security 5. Discuss Kerberos and web security protocols

UNIT-I :	**(10 Periods)** **Introduction:** Attributes of Security, Integrity, Authenticity, Non-repudiation, Confidentiality, Authorization, Anonymity, Types of Attacks, DoS, IP Spoofing, Replay, Man-in-the-Middle W attacks., General Threats to Computer Network,Worms, Viruses, Trojans
UNIT-II :	**(16 Periods)** **Secret Key Cryptography:** DES, Triple DES, AES, Key distribution, Attacks **Public Key Cryptography:** RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks
UNIT-III :	**(11 Periods)** **Integrity, Authentication and Non-Repudiation**: Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication
UNIT-IV :	**(15 Periods)** **PKI Interface:** Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN's. **Smart Cards:** Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards
UNIT-V :	**UNIT-V (5 Periods)** **Applications:** Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)
Learning Resources :	1. Cryptography and Network Security -William Stallings, 4th Edition. pearson. 2009 2. Behrouz A Forouzan, "Cryptography and Network Security", TMH, 2009 3. Joseph Migga Kizza," A guide to Computer network security", Springer, 2010 4. Dario cataiano," Contemporary Cryptalogy", Springer, 2010

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Syllabus for M.Tech. – Second Semester

SUB: SOFTWARE LAB-II
(Distributed Computing and Advanced Databases Lab)

Instruction : 3 Periods per week	Semester End Exam Marks: 50	Subject Reference Code: CS5181
Credits : 3		Duration of Semester End Exam : 3 Hours

COURSE OBJECTIVES	COURSE OUTCOMES
Student should be able to:	***At the end of the course students will be able to:***
Implement distributed applications with database connectivity using component technologies.	6. Develop, test and debug RPC based client-server programs in Linux. 7. Implement programs to demonstrate RMI with database connectivity. 8. Develop application using CORBA middleware. 9. Develop an application using EJB involving DB connectivity. 10. Implement Web Service using XML and SOAP protocol.

Experiments :	**(12 Periods)** **Distributed Computing:** 1. Applications using RPC 2. Application using CORBA 3. Application using EJB 4. Application using XML, SOAP **Advanced Databases:** An application involving above technologies and database has to developed. Note: The students have to submit a report at the end of the semester.
Learning Resources :	1. NirvaMorisseau-Leroy, Martin K. Solomon, Julie Basu, "Oracle8i Java Component Programming With EJB, CORBA AND JSP", Tata McGraw Hill, 2000.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Syllabus for First Year M.Tech– Second Semester

Seminar-II

Instruction : 3 Periods per week	Semester End Exam Marks : -	Subject Reference Code : CS5196
Credits : 2	Sessional Marks: : 50	Duration of Semester End Exam : -

COURSE OBJECTIVES	COURSE OUTCOMES
The course will enable the students to:	***At the end of the course students should be able to:***
Students will acquire knowledge on latest technologies and on-going research areas in Computer Science and Engineering .	1. Improve presentation and communication skills. 2. Aware of recent advancements in industry and new research trends. 3. Collect information through literature survey, analyze and present them. 4. Acquire knowledge about new hardware and software needs of market. 5. Acquire technical document writing skills.

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members.
Students are to be exposed to following aspects of seminar presentation.

Literature survey
Organization of material
Preparation of OHP slides / PC presentation
Technical writing.

Each student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through OHP, PC and slide project followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The Sessional marks will be awarded to the students by at least 2 faculty members on the basis of an oral and a written presentation as well as their involvement in the discussion. Average of two presentations is considered for award of sessional marks for each student.