DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD / NP /M.E./M.Tech./97/2012

It is hereby notified for the information of all concerned that, the Academic Council at its meeting held on 06-07-2012 **has accepted the following New Syllabi** under the Faculty of Engineering & Technology as appended herewith :-

Sr. No.	Syllabi.
[1]	M.E. Mechanical,
[2]	M.E. Mechanical [Design Engineering],
[3]	M.E. [Thermal],
[4]	M.E. [Biotechnology],
[5]	M. Tech. [Computer Science and Technology],
[6]	M.Tech. [Food Processing Tech.].

This is effective from the academic year 2012-2013 and onwards.

All concerned are requested to note the contents of this circular for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.ACAD/ NP/ M.TECH./
2012/20668-72

A.C.S.S. I.No.84

Date:- 03-08-2012.

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Director,
Board of College and
University Development.

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

Copy to :-

1] The Controller of Examinations,
2] The Superintendent, [Engineering Unit],
3] The Superintendent, [Eligibility Unit],
4] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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S/030812/-*

SCHEME AND DETAILED SYLLABUS

Of

M. Tech. Computer Science and Technology,

2012-13

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

DR.BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Teaching / Examination Scheme for the degree of **Master of Technology (Computer Science & Technology)**
with effect from
Year 2012-13

Semester - I

Sr. No.	Course Code.	Name Of Subject	Teaching hours / week			Examination Scheme - Marks				
			L	T	Total Hours	Theory	Class Test	Term Work	Viva-Voce	Total
1	MTCST111	Advanced Networking	3	1	4	80	20	-	-	100
2	MTCST112	Software Reliability	3	1	4	80	20	-	-	100
3	MTCST113	Research Methodology	3	1	4	80	20	-	-	100
4	MTCST114	Real time Systems	3	1	4	80	20	25	-	125
	MTCST115	Elective- I	3	1	4	80	20	25	-	125
5	MTCST116	Lab- I	-	6	6	-	-	50	-	50
6	MTCST117	Seminar - I	-	4	4	-	-	50	-	50
		Total	15	9	30	400	100	150	-	650

Elective-I		
1.Advanced Image Processing		
2.Pattern Recognition		

Semester - II

Sr. No.	Course Code.	Name Of Subject	Teaching hours / week			Examination Scheme - Marks				
			L	T	Total Hours	Theory	Class Test	Term Work	Viva-Voce	Total
1	MTCST121	Business Intelligence	3	1	4	80	20	-	-	100
2	MTCST122	Advanced Operating System	3	1	4	80	20	-	-	100
3	MTCST123	Performance Evaluation and Optimization	3	1	4	80	20	-	-	100
	MTCST124	Smart Phone Programming	3	1	4	80	20	25	-	125
5	MTCST125	Elective - II	3	1	4	80	20	25	-	125
6	MTCST126	Lab - II	-	6	6	-	-	50	-	50
6	MTCST127	Seminar - II	-	4	4	-	-	50	-	50
		Total	15	9	30	400	100	150	-	650

Elective-II	
1.Parallel Processing	
2.Cloud Computing	

Semester - III

Sr. No.	Course Code.	Name Of Subject	Institutional hours / week			Examination Scheme - Marks			
			Counseling	Dissertation work	Total Hours	Theory	Term Work	Viva-Voce	Total
1	MTCST211	Dissertation Part-I	4	20	24	-	50	50	100
		Total	4	20	24	-	50	50	100

Semester - IV

Sr. No.	Course Code.	Name Of Subject	Institutional hours / week			Examination Scheme - Marks			
			Counseling	Dissertation work	Total Hours	Theory	Term Work	Viva-Voce	Total
1	MTCST221	Dissertation Part-II	4	20	24	-	100	200	300
		Total	4	20	24	-	100	200	300
		Grand Total							1700

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First Year M. Tech. (Computer Science & Technology) Semester-I

Code No.: MTCST111 | **Title: Advanced Networking**
Teaching Scheme: 04 Hrs/week | **Class Test: 20**
Theory: 03Hrs/week | **Theory Examination (Duration): 03 Hrs**
Tutorial: 1hr/batch/week | **Theory Examination (Marks): 80**

Objectives	:	• To develop practical networking knowledge and skills in a professional environment and design, build & maintain computer networks capable of supporting local and global environment. • To learn how to resolve issues related with congestion control.
Unit-I	:	**Building a Network** Applications, Requirements Scalable Connectivity 8, Cost-Effective Resource Sharing Support for Common Services 18, Manageability, Network Architecture Layering and Protocols, Internet Architecture ,Implementing Network Software Application Programming Interface(Sockets), Example Application, Performance Bandwidth and Latency, Delay× Bandwidth , Product, High-Speed Networks, Application, Performance Needs **(6 Hrs)**
Unit-II	:	**Connecting to a Network** Classes of Links, Encoding (NRZ, NRZI, Manchester, 4B/5B) ,Framing Byte-Oriented Protocols, Bit-Oriented Protocols (HDLC) , ,Error Detection ,Two-Dimensional Parity ,Internet Checksum Algorithm ,Cyclic Redundancy Check, Reliable Transmission Stop-and-Wait ,Sliding Window **(6 Hrs)**
Unit-III	:	**Internetworking** Switching and Bridging Datagrams, Virtual Circuit Switching ,Source Routing ,Bridges and, LAN Switches ,Basic Internetworking (IP) What Is an Internetwork? , Service Model , Global Addresses Datagram Forwarding in IP , Subnetting and Classless Addressing, Address Translation (ARP), Virtual Networks and Tunnels ,Routing Network as a Graph ,Distance Vector (RIP) **(8 Hrs)**
Unit-IV	:	**Advanced Internetworking** The Global Internet ,Routing Areas , Interdomain Routing (BGP), IP Version 6(IPv6), Multicast Multicast Addresses ,Multicast Routing (DVMRP, PIM, MSDP), Multiprotocol Label Switching (MPLS) Destination-Based Forwarding ,Explicit Routing **(6 Hrs)**
Unit-V	:	**End-to-End Protocols** Simple Demultiplexer (UDP), Reliable Byte Stream (TCP) , End-to-End Issues , Segment Format, Connection Establishment and Termination, Triggering Transmission , Adaptive Retransmission , Record Boundaries TCP Extensions , Performance, Remote Procedure Call **(8 Hrs)**
Unit-VI	:	**Congestion Control and Resource** Allocation Issues in Resource Allocation, Network Model, Taxonomy ,Evaluation Criteria, Queuing Disciplines FIFO Fair Queuing, TCP Congestion Control ,Congestion- Avoidance Mechanisms. **(6 Hrs)**

Reference Books:	:	1. Larry L. Peterson and Bruce S. Davie, "Computer Networks A system Approach", Elsevier-Morgan Kaufmann Publications, Fifth Edition. 2. Behrouz A. Forouzan, "Data Communication and networking", TMH, Fourth Edition 3. E Bryan Carne, " A professional's Guide to Data Communication in a TCP/IP world, Artech House.

Section A: Includes Unit I, II and III; Section **B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of F. Y. M. Tech.(Computer Science & Technology) Semester-I

Code No.:MTCST112
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Software Reliability
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To manage and improve the reliability of the software. • To check the efficiency of development activities. • To estimate the software reliability at the end of validation activities and in operation. • To compare the various software reliability models
Unit-I	:	**Introduction to Software Reliability** Basic Concepts – Failure and Faults – Environment – Availability –Modeling – Uses. **(6 Hrs)**
Unit-II	:	**Software Reliability Modeling** Concepts – General Model Characteristic – Historical Development of models – Model Classification scheme – Markovian models – General concepts – General Poisson-Type Models – Binomial – Type Models – Poisson-Type models – Fault reduction factor for Poisson-Type models. **(8 Hrs)**
Unit-III	:	**Comparison of Software Reliability Models** Comparison Criteria – Failure Data – Comparison of Predictive Validity of Model Groups – Recommended Models – Comparison of Time Domains – Calendar Time Modeling – Limiting Resource Concept – Resource Usage model – Resource Utilization – Calendar Time Estimation and confidence Intervals – Reliability Growth Model – Model Evaluation. **(8 Hrs)**
Unit-IV	:	**Measurements Theory** Fundamentals of Measurement – Measurements in Software Engineering – Scope of Software metrics – Measurements theory – Goal based Framework – Software Measurement Validation -- Measurement of Quality – Quality Management Models. **(8Hrs)**
Unit-V	:	**Reliability Assessment** Ability to Test Entire System -- Software Reliability Improvement Techniques Measurement of Internet Product Attributes — Orthogonal Classification **(4 Hrs)**
Unit-VI		**Reliability Evaluation of Architectural analysis** Path based models- state based models- additives- Model Driven Engineering-UML 2.0-Extension for reliability evaluation. **6 Hrs)**

Reference Books	:	1. John D. Musa, Anthony Iannino, Kazuhira Okumoto, "Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and Technology", McGraw Hill, 1987. 2. John D. Musa, "Software Reliability Engineering", Computing McGraw Hill, 1999. 3. Michael R. Lyu ,Handbook of Software Reliability Engineering , McGraw-Hill 4 Hoang Pham, "System software reliability", Springer series in Reliability Engineering.

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively.

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For 80 marks Paper:

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6. Five questions in each section
7. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
8. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First Year M.Tech.(Computer Science and Technology) Semester-I

Code No:MTCST113	**Title: Research Methodology**
Teaching Scheme: 04Hrs/week	**Class Test: 20**
Theory: 03Hrs/week	**Theory Examination (Duration): 03 Hrs**
Tutorial: 1hr/batch/week	**Theory Examination (Marks): 80**

Objectives	:	• To learn the meaning of research. • To know how research is done. • To learn about sampling design. • To learn methods of data collection. • To learn processing and analysis of data.
Unit-I	:	**Research Methodology : An Introduction** Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research approaches, Significance of Research, Research methods versus Methodology, Research and Scientific method, Importance of knowing how research is done Research process, Criteria of good research, Problems Encountered by Researchers . **(6 Hrs)**
Unit-II	:	**Research Problem and Research Design** What is research problem, selecting the problem, Necessity of defining the problem, Technique involved in defining the problem, Research Design: Meaning of research design, Need for research design, Features of a good design, Important concepts relating to research design, Different research designs, Basic principles of experimental designs. **(7 Hrs)**
Unit-III	:	**Sampling Design** Implication of sample design, Steps in sample design, Criteria of selecting a sampling procedure, Characteristics of a good sample design, different types of sample designs, How to select a random sample, Random sample from an infinite universe, Complex random sampling design. **(7 Hrs)**
Unit-IV	:	**Data Collection** Collection of primary data, Observation method, Interview method, Collection of data through questionnaires, Collection of data through schedules, Difference between questionnaires and schedules, Other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection, case study method. **(6 Hrs)**
Unit-V	:	**Data Analysis** Processing Operations, Problems in processing, Elements/Types of analysis, Statistics in research, Measures of central tendency, Measures of dispersion, Measures of asymmetry, Measures of relationship, Regression analysis, Multiple correlation and regression, partial correlation, Association in case of attributes, Measures: index numbers, Time series analysis. **(7 Hrs)**

Unit-VI	:	**Testing of Hypotheses** What is Hypothesis, Procedure for hypothesis testing, Flow diagram for hypothesis testing, Measuring the power of a hypothesis test, Test of hypotheses, Important parametric tests, Hypothesis testing of means, Hypothesis testing for differences between means, Hypothesis testing for comparing two related samples, Hypothesis testing of proportions, Hypothesis testing for differences between proportions, Limitations of tests of hypotheses, Introduction to SPSS. **(7 Hrs)**
Reference Books:	:	1. "Research Methodology- Methods and Techniques", C.R.Kothari, New Age International Publishers 2. "Methodology And Techniques Of Social Research", Wilkinson & Bhandarkar, Himalaya Pub 3. "Research Methodology", Panneerselvam, Prentice Hall 4. "Scientific Social Surveys And Research", Pauline Vyoung, Prentice-Hall

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

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For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First year M.Tech(Computer Science and Technology) Semester-I

Code No.:MTCST114 | **Title: Real Time Systems**
Teaching Scheme:04 hrs/week | **Class Test: 20 marks**
Theory: 3hrs/week | **Theory Examination (Duration): 3 Hours**
Tutorial: 1hr/batch/week | **Theory Examination (Marks): 80**

Objectives	:	• The contents aims to develop the knowledge of the student in the direction of • Real Time Systems and solving the practical problems in the development of typical real time application.
Unit-I	:	**Introduction and Requirement analysis of real time systems** Real time systems, Types of real time systems, Basic architecture of real time systems, Task description, Characteristics of real time systems, What is requirement analysis? Difference between analysis of general purpose systems and real time systems, Estimation of execution time, Framing of task's various parameters such as release time, period of invocation, computation time and deadlines **(5 Hrs)**
Unit-II	:	**Design issues in real time systems and Programming in real time systems** Difference between design of general purpose systems and real time systems. Use of model driven engineering in real time system design, Real time system design using Event Studio, Feature descriptive language to describe design of real time systems, Case studies of real time system design, Difference between programming of general purpose systems and real time systems. Various programming languages for real systems, Ada, Real Time Java **(6 Hrs)**
Unit-III	:	**Real time operating systems** Difference between operating system of general purpose systems(GPOS) and real time operating systems. Monolythic OS and Modular OS, Kernel, microkernel and nanokernel, RT LINUX,POSIX APIs, LynxOS, VxWorks **(5Hrs)**
Unit-IV	:	**Real time database systems** Difference between data base system of general purpose systems and real time Database systems, Architecture of real time database systems, Concurrency issues of real time database systems, Scheduling of RTDB transaction, Quality service in real time database , In memory database systems, Design issues of in memory database systems. **(6 Hrs)**
Unit-V	:	**Real Time Communication** Need for real time communication, Network topology in real time communication, Message sending techniques, Real time communication network design issues, Various real time communication protocols. **(6Hrs)**
Unit-VI	:	**Real time scheduling** What is real time scheduling? Classification of real time scheduling algorithms, various scheduling properties, Various scheduling metrics, Independent task scheduling algorithms, Aperiodic task scheduling algorithms, Precedence constraint task scheduling algorithms. **(12 Hrs)**

Reference Books:	:	1.Real-Time Systems, C.M.krishna and Kang G.Shin, McGraw Hill 2. Real Time Systems , Jane W.S.Liu ,Pearson

Section A: Includes Unit I, II and III; Section **B**: Includes Unit IV, V and VI

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First Year M.Tech.(Computer Science & Technology) Semester-I

Code No.:MTCST115
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Elective-I (Advanced Image Processing)
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To understand the digital image processing operations and their applications • To recognize how image compression and segmentation techniques enhance digital images • To develop various feature extraction and object recognition skills • To understand multiresolution image processing
Unit-I	:	**Introduction to Digital Image Processing** Fundamental steps in digital image processing, Sampling and quantization, Histogram equalization, Discrete Fourier Transform, Applications of DIP **(4 Hrs)**
Unit-II	:	**Image Compression** Fundamentals, Image compression models, Error-free compression: Huffman Coding algorithm, Lossy compression, Block transform coding, Digital Image watermarking **(8 Hrs)**
Unit-III	:	**Image Segmentation** Fundamentals, Detection of discontinuities, Thresholding techniques, Region oriented segmentation, segmentation using morphological watersheds: Watershed segmentation, Use of motion in segmentation **(8 Hrs)**
Unit-IV	:	**Representation and Description** Representation: Chain codes, Signatures, Skeletons, Feature Extraction Methods: Boundary descriptors: Simple descriptors, Shape numbers, Regional descriptors: Simple descriptors, Topological descriptor, Texture, Relational descriptors **(8 Hrs)**
Unit-V	:	**Object Recognition** Patterns and pattern classes, Recognition based on decision-theoretic methods: Matching, Optimum Statistical Classifiers, Neural Networks, Structural Methods: Matching Shape Numbers **(8 Hrs)**
Unit-VI	:	**Wavelet Transform and Multiresolution Processing** Image Pyramids, Multiresolution expansions: Series expansion, Wavelet functions, Wavelet transforms in one dimension: Discrete Wavelet transform, wavelet transforms in two dimensions **(4 Hrs)**

Reference Books:	:	1. Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, Third edition, Pearson publication. 2. Digital Image Processing and Analysis, Chanda, Majumder, Second edition, PHI publication. 3. Digital Image Processing and Computer Vision, Sonka, Hlavac, Boyle, Cengage Learning publication. 4. Digital Image Processing using Matlab, Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Second edition, Mc Graw Hill publication

Section A: Includes Unit I, II and III; Section **B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First Year M.Tech.(Computer Science & Technology) Semester-I

Code No.:MTCST115
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Elective-I (Pattern Recognition)
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To understand pattern recognition systems and design cycle • To study how bayesian decision theory features are useful pattern recognition • To estimate maximum likelihood and bayesian parameter • To estimate density using non-parametric techniques • To understand clustering and Hidden Markov Models
Unit-I	:	**Introduction to Pattern Recognition** Machine perception, An example of pattern recognition, Pattern recognition systems, The design cycle, Learning and adaptation **(4 Hrs)**
Unit-II	:	**Bayesian Decision Theory** Introduction, Continuous features, Minimum error-rate classification, Classifiers, Discriminant functions, and Decision surfaces, Normal density, Bayes Decision theory - Discrete features, Compound Bayesian decision theory and context **(8 Hrs)**
Unit-III	:	**Maximum Likelihood and Bayesian Parameter Estimation** Introduction, Maximum-Likelihood Estimation: The General Principal, The Gaussian Case, Bayesian estimation: The Class Conditional Densities, The Parameter Distribution, Bayesian parameter estimation–Gaussian case **(8 Hrs)**
Unit-IV	:	**Non-parametric Techniques for Density Estimation** Introduction, Density Estimation, Parzen-window method: Convergence of the Mean, Classification Example, K-Nearest Neighbor method: K-Nearest Neighbor and Parzen-window Estimation, Estimation of A Posteriori Probabilities **8 Hrs)**
Unit-V	:	**Un-supervised Learning and Clustering** Introduction, Mixture densities and identifiability, Maximum likelihood estimates, K-means clustering, Data description and clustering, Criteria function for clustering, Component analysis **(8 Hrs)**
Unit-VI	:	**Discrete Hidden Markov Models** First-Order Markov Models, First-Order Hidden Markov Models, Hidden Markov Model Computation, Evaluation, Decoding, Learning. **(4 Hrs)**

Reference Books:	:	1. Pattern Classification, Richard O. Duda, Peter E. Hart, David G. Stork, Wiley Student Edition, Second Edition, John Wiley publication. 2. Pattern Recognition and Image Analysis – Earl Gose, Richard John baugh, Steve Jost PHI 2004 3. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009 4. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Section A: Includes Unit I, II and III; Section **B**: Includes Unit IV, V and VI.

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Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of First Year M.Tech (Computer Science and Engineering) Semester-I/II

Code No.: MTCST 116 **Title: Lab I:**
Teaching Scheme:(06) Hours per week **Teachers assessment:50 marks**
Practical: 6 hrs per week
Total Examination (Marks):50

Course Objectives	:	1. Develop student for report/paper writing.

List of Practicals	:	1	Prepare one paper in latex in IEEE format on given title.
		2	Prepare one presentation in Latex on given topic
		3	Prepare one mini project report in Latex on given topic
		4	Collatz sequence 1. Start with an arbitrary (positive) integer. 2. If the number is even, divide by 2; if the number is odd multiply by 3 and add 1. 3. Repeat the procedure with the new number. 4. There is a cycle of 4, 2, 1 at which the procedure loops. Write a program that accepts the starting value and prints out the Collatz sequence. Implement this in Python
		5	You are given date strings of the form "29, Jul 2009", or "4 January 2008". In other words a number a string and another number, with a comma sometimes separating the items.Write a function that takes such a string and returns a tuple (yyyy, mm, dd) where all three elements are ints. Implement this in Python

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Engineering & Technology)
Syllabus of First year M.Tech.(Computer Science and Technology)Semester-II

Code No.:MTCST121	**Title: Business Intelligence**
Teaching Scheme:04 hrs/week	**Class Test: 20 marks**
Theory: 3hrs/week	**Theory Examination (Duration): 3 Hours**
Tutorial: 1hr/batch/week	**Theory Examination (Marks): 80**

Objectives	:	• Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence • Demonstrate understanding of technology and processes associated with Business Intelligence framework • Demonstrate understanding of Data Warehouse implementation methodology and project life cycle • Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal • Design an enterprise dashboard that depicts the key performance indicators which helps in decision making • Demonstrate application of concepts in Microsoft BI suite
Unit-I	:	**Introduction to Business Intelligence** Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities **(4 Hrs)**
Unit-II	:	**Basics of Data Integration (Extraction Transformation Loading)** Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications **(10 Hrs)**
Unit-III	:	**Introduction to Multi-Dimensional Data Modeling** Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS **(6 Hrs)**
Unit-IV	:	**Basics of Enterprise Reporting** Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS , Oracle Business Intelligence – OBIEE, OBIEE; Online analytical processing (OLAP): cubes, attribute hierarchies, and measures/metrics. Using Oracle Analytic Workspace Manager (AWM) to build cubes. Business performance management

Unit-V	:	**Text and Web Mining** Text mining concepts,data mining vs Text mining,text mining application area,Text mining terminology,NLP,Text mining applications,Text mining process,web mining overview,web contents mining,web usage mining **(6 Hrs)**
Unit-VI	:	**Implementing BI** Managerial issues, Connecting BI system to databases on demand BI, benefits of on demand BI, Limitations, issues of legality ,privacy and ethics, web 2.0 revolution, online social networking, virtual tradeshows, collaborative decision making, reality mining. **(6 Hrs)**
Reference Books:	:	1.Business Intelligence: A Managerial Approach, 2nd Edition, Prentice Hall (2011) Turban, Sharda, Delen, and King 2. Business Intelligence, David Loshin, Morgan Kaufmann publisher

Section A: Includes Unit I, II and III; Section **B**: Includes Unit IV, V and VI

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4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of F. Y. M. Tech.(Computer Science & Technology) Semester-II

Code No.:MTCST122
Teaching Scheme:04 hrs /week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Advanced Operating System
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To get a comprehensive knowledge of the architecture of distributed systems. • To understand the deadlock and shared memory issues and their solutions in distributed environments. • To know the security issues and protection mechanisms for distributed environments. • To get a knowledge of multiprocessor operating system and database operating systems.
Unit-I	:	**Architectures of Distributed Systems** System Architecture types - issues in distributed operating systems - communication networks – communication primitives. Theoretical Foundations - inherent limitations of a distributed system – lamp ports logical clocks – vector clocks – casual ordering of messages – global state – cuts of a distributed computation – termination detection. Distributed Mutual Exclusion – introduction – the classification of mutual exclusion and associated algorithms – a comparative performance analysis. **(6 Hrs)**
Unit-II	:	**Distributed Deadlock Detection** Introduction - deadlock handling strategies in distributed systems – issues in deadlock detection and resolution – control organizations for distributed deadlock detection – centralized and distributed deadlock detection algorithms –hierarchical deadlock detection algorithms. Agreement protocols – introduction-the system model, a classification of agreement problems, solutions to the Byzantine agreement problem, applications of agreement algorithms. Distributed resource management: introduction-architecture – mechanism for building distributed file systems – design issues – log structured file systems. **(8 Hrs)**
Unit-III	:	**Distributed shared memory** Architecture– algorithms for implementing DSM – memory coherence and protocols – design issues. Distributed Scheduling – introduction – issues in load distributing – components of a load distributing algorithm – stability – load distributing algorithm – performance comparison – selecting a suitable load sharing algorithm – requirements for load distributing -task migration and associated issues. **(8 Hrs)**
Unit-IV	:	**Multiprocessor operating systems** Basic multiprocessor system architectures – inter connection networks for multiprocessor systems – caching – hypercube architecture. Multiprocessor Operating System - structures of multiprocessor operating system, operating system design issues- threads- process synchronization and scheduling.

Unit-V	:	**Database Operating systems** Introduction- requirements of a database operating system Concurrency control : theoretical aspects – introduction, database systems – a concurrency control model of database systems- the problem of concurrency control – serializability theory- distributed database systems, concurrency control algorithms – introduction, basic synchronization primitives, lock based algorithms- timestamp based algorithms . **(8 Hrs)**
Unit-VI		**Failure Recovery and Fault Tolerance** Failure Recovery and Fault tolerance: introduction– basic concepts – classification of failures – backward and forward error recovery, backward error recovery- recovery in concurrent systems – consistent set of check points – synchronous and asynchronous check pointing and recovery – check pointing for distributed database systems- recovery in replicated distributed databases **(5 Hrs)**
Reference Books	:	1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001 2. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003 3. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003. 4. Andrew S.Tanenbaum, "Distributed operating system", Pearson education, 2003

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively.

Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of First Year M.Tech.(Computer Science and Technology) Semester-II

Code No:MTCST123	**Title: Performance Evaluation and optimization**
Teaching Scheme: 04 Hrs/week	**Class Test: 20**
Theory: 03Hrs/week	**Theory Examination (Duration): 03 Hrs**
Tutorial: 1hr/batch/week	**Theory Examination (Marks): 80**

Objectives	:	• To know the fundamental techniques in performance evaluation of computer systems. • To understand computer system as well as various analysis techniques such as statistics, probability theory, experimental design, simulation and queuing theory.
Unit-I	:	**An Overview Of Performance Evaluation** The art of performance evaluation, common mistakes in performance evaluation, a systematic approach to performance evaluation, selecting an evaluation technique, selecting performance metrics, commonly used performance metrics, utility classification of performance metrics, setting performance requirements. **(6 Hrs)**
Unit-II	:	**Measurement techniques and tools** Types of workloads: addition instruction, instruction mixes, kernels, the art of workload selection: services exercised, level of detail, representativeness, timeliness, other considerations in workload selection, workload characterization techniques: Averaging, Specifying dispersion, Single-parameter histograms, Multiparameter histograms, Principal-component analysis, Markov models, Clustering. Monitors: monitor terminology, monitor classification, software monitors, hardware monitors, software versus hardware monitors, firmware and hybrid monitors, distributed system monitors. **(7 Hrs)**
Unit-III	:	**Probability Theory and Statistics** Summarizing Measured Data: Basic probability and statistics concepts, summarizing data by a single number, selecting among the mean, median, and mode, common misuses of means, geometric mean, harmonic mean, mean of a ratio, summarizing variability, selecting the index of dispersion, determining distribution of data. Comparing systems using sample data: Sample versus population, Confidence interval for the mean, Testing for a zero mean. Experimental design and analysis: terminology, common mistakes in experimentation, types of experimental designs. **(7 Hrs)**
Unit-IV	:	**Simple Linear Regression Models** Definition of a good model, estimation of model parameters, allocation of variation, standard deviation of errors, confidence intervals for regression parameters, confidence intervals for predictions, visual tests for verifying the regression assumptions. **(6 Hrs)**
Unit-V	:	**Simulation**

		Introduction to simulation, common mistakes in simulation, other causes of simulation analysis failure, terminology, selecting a language for simulation, types of simulations, event-set algorithms. Analysis of simulation results: Model verification techniques, Model validation techniques. Commonly used distributions: Bernoulli distribution, Beta distribution, Binomial distribution, Chi-square distribution, Erlang distribution, Exponential distribution, F distribution, Gamma distribution, Geometric distribution, Lognormal distribution, Negative binomial distribution, Normal distribution, Pareto distribution, Pascal distribution, Poisson distribution, Student's t Distribution, Uniform distribution (continuous), Uniform distribution (discrete), Weibull distribution n, Relationships among distributions. **(7Hrs)**
Unit-VI	:	**Decision Theory and Queuing Theory** Steps in Decision Theory Approach, Decision-Making Environments, Decision-Making under conditions of certainty, Decision –Making under conditions of uncertainty, Decision-Making under conditions of risk, Maximum likelihood criteria. Queing Theory: Queing Notation, Rules for all queues, Little's Law, Types of stochastic processes, M/M/1 queue, M/M/m queue, M/M/m/B queue with finite buffers. **(7 Hrs)**
Reference Books:	:	1."The Art of Computer System Performance Analysis", Raj Jain, Wiley India publication 2. "Operation Research", Prem kumar Gupta, D.S. Hira, S. Chand publications 3. "Quantitative system performance -Computer system analysis with queuing network models", Edward D. Lazawska, John zahorjan, G. Scott Graham, Kenneth C.Sevcik, Prentice Hall publication 4. "Measuring Computer Performance - A Practitioner's Guide", D.J. Lilja, Cambridge University Press

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.:MTCST124
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Smart Phone Programming
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To get advanced knowledge of smart phone programming • An architectural overview of WP7 • Comparisons with iOS and Android • How to build your applications • Methods for testing applications • Using the Windows Phone Emulator • How to publish your applications • Understanding WP7 UI principles • Building a UI • Customizing a UI
Unit-I	:	**INTRODUCTION** An Overview Of Windows Phone 7, Application Framework, Comparisons With Android And IPHONE, Targeting Windows Phone 7, The Hardware Chassis, Sensors And Services.**(5 Hrs)**
Unit-II	:	**THE DEVELOPMENT ENVIRONMENT** Creating WP7 Applications with Visual Studio, Differences between Wp7 and Android Development, Testing WP7 Applications in the Windows Phone Emulator, Testing WP7 Applications on the Actual Windows Phone Device. Basic application project structure, Comparing Application Project Structure for Android and IOS, Application execution model and life cycles, Comparing Application Model and Life Cycles in Android and IOS, Creating the WP7 Life Cycles Application. **(10 hrs)**
Unit-III	:	**USER INTERFACES** UI design principles, comparing the WP7 display to ANDROID AND IOS, building the WP7 UI, Defining WP7 UI Programmatically, Pages and Navigation Among Pages, Sharing Data among Pages, Using Controls, Overview of Pivot and Panorama Control, Example of Using Pivot and Panorama Control, Handling UI Events, Other UI Considerations, UI customization **(7 Hrs)**
Unit-IV	:	**APPLICATION DATA STORAGE** Application storage on mobile devices, local files and databases, isolated storage, saving data to the cloud, data storage design considerations **(5 hrs)**

Unit-V	:	**WEB SERVICES AND PUSH NOTIFICATIONS AND LEVERAGING LOCATION AND MAPS** A primer of web services, consuming web services on wp7, wp7 push notifications, mobile advertising basics. Location frameworks roundup, getting current location, using maps, combining the location service and bing map **(6 hrs)**
Unit-VI	:	**MULTIMEDIA** Multimedia overview, WP7 Multimedia, IOS multimedia, Android Multimedia, playing audio on WP7, Playing Sounds Using Sound Effect, Sound, Picture, and Graphics Integration, playing video on WP7, Playing Video Using Media Element, accessing the microphone on WP7. **(7 Hrs)**
Reference Books:	:	1.Charles PetZold, "Programming Windows phone 7", MICROSOFT publication,2010 2.Zhinan Zhou, Robert Zhu, Pei Zheng, "Windows phone 7 programming for android and IOS developers", John Wiley & Sons, Inc. 3.Sams Teach Yourself Android Application Development in 24 Hours By Darcey by pearson 4.Android for Programmers: An App-Driven Approach ,Deitel / Deitel / Deitel / Morgano by Pearson

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V & VI

Pattern of Question Paper:

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For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Code No.:MTCST125
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Elective-II (Cloud Computing)
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To get advanced knowledge of Cloud computing • An architectural overview of Windows Azure • How to build your applications • Methods for testing applications
Unit-I	:	**Introduction** What Is the Cloud? The Emergence of Cloud Computing ,The Global Nature of the Cloud Cloud-Based Service Offerings ,Grid Computing or Cloud Computing? Is the Cloud Model Reliable? Benefits of Using a Cloud Model ,What About Legal Issues When Using Cloud Models? What Are the Key Characteristics of Cloud Computing? Challenges for the Cloud **(5 Hrs)**
Unit-II	:	**Web Services Delivered from the Cloud** Communication-as-a-Service (CaaS) , Advantages of CaaS , Fully Integrated, Enterprise-Class Unified Communications , Amazon Web Services asInfrastructure-as-a-Service (IaaS), Modern On-Demand Computing , Amazon's Elastic Cloud , Amazon EC2 Service Characteristics , Mosso Rackspace),Monitoring-as-a-Service (MaaS) , Protection Against Internal and External Threats Delivering Business Value , Real-Time Log Monitoring,Enables Compliance , Google AppEngine and Windows Azure Platform as a Platform-as-a-Service (PaaS), The Traditional On-Premises Model , The New Cloud Model, Key characteristics of PaaS , Software-as-a-Service (SaaS), SaaS Implementation Issues, Key Characteristics of SaaS ,Benefits of the SaaS Model **(10 hrs)**
Unit-III	:	**Building Cloud Networks** The Evolution from the MSP Model to Cloud Computing and Software-as-a-Service From Single-Purpose Architectures to Multipurpose Architectures , Data Center Virtualization The Cloud Data Center, Collaboration ,Why Collaboration? , Service-Oriented Architectures as a Step Toward Cloud Computing , Basic Approach to a Data Center-Based SOA , Planning for Capacity , Planning for Availability , Planning for SOA Security , The Role of Open Source Software in Data Centers , Where Open Source Software Is Used , Web Presence , Database Tier ,Application Tier , Systems and Network Management Tier. **(8 Hrs)**
Unit-IV	:	**Overview of the Windows Azure Platform** Introduction to Cloud Computing,Workload Patterns for the Cloud,"Introduction to Windows Azure,Under the Hood of Windows Azure,Windows Azure PLATFORM,Application Patterns & Architecture,Hands-On Demo,Case Studies. **(5 hrs)**
Unit-V	:	**Windows Azure Platform Architecture** The Windows Azure Developer Portal,Creating and Running Projects in the Azure Development Platform ,Installing Windows Azure SDK and Tools for Visual Studio,Installing and Building the Windows Azure SDK Sample Applications, The Development Fabric ,Development Storage Using Azure Application Templates for Visual Studio 2008 ,Web Cloud Services and Client Wrapper Class Libraries. **(7 Hrs)**

Unit-VI	:	**Analyzing the Windows Azure Operating System** A Quick Tour of theWindows Azure OS ,The Lifecycle of a Windows Azure Service,Creating the Host VM and the First Guest VM on a Physical Server,Adding Guest VMs to a Host VM ,Maintaining Role Instance Health ,Upgrading Service Software and Windows Azure. **(5hrs)**
Reference Books:	:	1.Roger Jennings ,"Cloud Computing with the Windows Azure Platform"Wiley Publications 2. John W. Rittinghouse, James F. Ransome, "Cloud Computing Implementation, Management,and Security",CRC Press 3. David E.V. Sarna, " Implementing and Developing Cloud Computing Applications"CRC Press.

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V & VI

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2. Five questions in each section
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Syllabus of F. Y. M. Tech.(Computer Science & Technology) Semester-II

Code No.:MTCST125
Teaching Scheme:04 hrs/week
Theory: 3hrs/week
Tutorial: 1hr/batch/week

Title: Elective-II(Parallel Processing)
Class Test: 20 marks
Theory Examination (Duration): 3 Hours
Theory Examination (Marks): 80

Objectives	:	• To get the knowledge related to current technologies and architectures so as to find research oriented topics.
Unit-I	:	**Introduction to Parallel Processing:** Why Parallel architecture?- Application trends, Technology trends, Convergence-Communication , Shared memory, Message passing, Fundamental design issues-Communication Abstraction, naming. **(6 Hrs)**
Unit-II	:	**Parallel Programs:** Parallel application case studies, The parallelization process- Steps in the Process, Goals Simulating the evolution of galaxies, Computation Vs data. **(6 Hrs)**
Unit-III	:	**Interconnection Network Design** Introduction, organizational structure, Topologies, Routing, Switch design, Flow Control,Case studies. **(8 Hrs)**
Unit-IV	:	**Workload-driven Evaluation** Introduction, Scaling workload and machines-parameters, models. Evaluating a real machine, Evaluating architectural tradeoff. **(6 Hrs)**
Unit-V	:	**Shared Memory Multiprocessors** Introduction, Cache coherence, Memory consistency, Design space for snooping protocols, synchronization. **(8 Hrs)**
Unit-VI		**Scalable Multiprocessors** Introduction, Scalability, Realizing programming models, Physical DMA, User level access, Dedicated message processing. Shared physical address space, Comparison of communication performance. **(6 Hrs)**

Reference Books	:	1. Parallel Computer Architecture-A hardware/Software approach- David Culler, Jaswinder Pal Singh, Anoop Gupta. 2. John Hennessy and David Patterson, Computer Architecture: A Quantitative Approach, Morgan Kauffman Publisher. 3. Research Papers to be available in the class 4. Kai Hwang, "Advanced Computer Architecture", McGraw Hill International, 1993. 5. William Stallings, "Computer Organization and Architecture", Macmillan Publishing Company, 1990. 6. M. J. Quinn, "Designing Efficient Algorithms for Parallel Computers", McGraw Hill International, 1994. 7. John L. Hennessy and David A. Patterson, Computer Architecture A Quantitative approach, Morgan Kaufman Publishers. Inc., 1990. 8. D.P. Siewiorek, G.G. Bell, A. Newell, Computer Structures, Principle and Examples, McGraw Hill, 1982.

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

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Syllabus of First Year M.Tech (Computer Science and Engineering) Semester-II

Code No.: MTCST 126 **Title: Lab II:**
Teaching Scheme:(06) Hours per week **Teachers assessment:50 marks**
Practical: 6 hrs per week
Total Examination (Marks):50

Course Objectives	:	1. Develop student for report/paper writing.

List of Practicals	:	1	Prepare Literature survey on given topic. Refer at least 10 recent IEEE papers.
		2	Design new algorithm on above topic.
		3	Design mathematical model for the above designed algorithm.
		4	Study of performance evaluation methods – Analytical, Statistical, Computational, Mathematical, Experimental.
		5	Present atleast one paper on above topic.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment.
- Performing the experiments in the laboratory.
- Oral examination conducted on the syllabus and term work mentioned above.