BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering And Technology
M. Tech - Information Technology
New Syllabus

Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune

M. Tech (Information Technology)
(2019 CBCS COURSE)

Program Curriculum

VISION OF THE UNIVERSITY

Social Transformation through Dynamic Education

MISSION OF THE UNIVERSITY

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal and other deprived sections of the population

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be a leading Programme, transforming students into skilled IT professionals.

MISSION OF THE DEPARTMENT

• Amplify the student's technical skills by conducting continuing education

programs, organizing and participating in various technical events.

• Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.

• Provide an environment for effective social and ethical skills.

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2018 Course)

STRUCTURE & EXAMINATION PATTERN

MTech Information Technology

Semester I											Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18
Subjects	Teaching Scheme (Hrs) Hrs./ Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ Assignments	TW	Pract / Oral	TH	TW/PR/ OR	
Software Architecture	04	02	60	20	10	10	25	25	04	01	05
Machine Learning	04	02	60	20	10	10	25	25	04	01	05
Mobile Networks & Communication	04	--	60	20	10	10	--	--	04	--	04
Parallel Programming & Algorithms	04	--	60	20	10	10	--	--	04	--	04
Total	16	04	240	80	40	40	50	50	16	02	18

M.Tech (IT) Semester - I	Subject : SOFTWARE ARCHITECTURE	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work:25 Marks	**Total Credits : 05**
	Prat/Oral : 25 Marks	

The aim of the course is to design a system to provide the solution to the existing system

Course Objectives:

1) Analyze the problem in existing system.

2) Apply the efficient solution by wisely designing the architecture.

Course Prerequisites:

Students should have knowledge of

1) Basic knowledge of java programming.

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Course Outcome:

Students will be able to:

1) Understand problems in existing system

2) Analyze feasibility of design proposed.

3) Analyze the technology suitable to build the proposed system.

4)Understand the use of design pattern to design the architecture

5) Analyze the adherence of solution with the requirement

6) Apply the efficient architecture to optimize the performance of the system

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UNIT-I	**INTRODUCTION TO SOFTWARE ARCHITECTURE**	**(Hours)**
	Introduction to Software Architecture, Architecture of Business Cycle, software architecture requirements, Types of Architecture, Documenting software architectures, recent trends in software architectures.	06
UNIT-II	**DESIGN CONCERNS**	**(Hours)**
	Introduction to the issues in design, Considering important aspects during the design SRS, Cost, Security, Resources, Compatibility, Scalability, dependency. Selection of Technology according to the requirement.	06

UNIT-III	**DESIGN PATTERNS**	**(Hours)**
	Introduction to Design patterns, principles and expectations Types of design patterns Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite. Rules and regulations to select design patterns.	06
UNIT-IV	**TECHNOLOGIS USED IN MIDDLEWARE**	**(Hours)**
	Types of Middleware, Application servers, Introduction to Java EE, Introduction to Java EE , JDBC, RPC, RMI, EJB Architecture, Entity, Session, Message beans, XML, XSLT. Specifications and characteristics of Middleware technologies. Recent advances in Middleware technologies.	06
UNIT-V	**N TIER ARCHITECTURE**	**(Hours)**
	Introduction to tiers in Architecture, Types of Tiers , XML, Client side technologies HTML, DHTML, Java Applets, ActiveX controls, DOM, AJAX. Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.	06
UNIT-VI	**SERVER SIDE TECHNOLOGY**	**(Hours)**
	Multi-tier architectures, introduction to server side technologies: JSP, JSF, SOA, MVC. Java Servlets, introduction to framework struts, spring.	06

Assignment List:

1)	**Design an architecture to solve collision problem in Traffic Signaling System**
2)	**Design generalized and specialized approach to simulate traffic signaling system.**
3)	**Implement all types of driver to connect front end with back end using modular approach.**
4)	**Implement and maintain cookies in a structured relational database.**
5)	**Implement data and page transfer using servlet.**
6)	**Implement library management system using JSP.**
7)	**Implement**
8)	**Implement CRUD functionality using MVC architecture with struts framework.**

Text Books:

1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Publication
3)	OCM Java EE 6 Enterprise Architect Exam Guide (Oracle Press) by Paul Allen , Joseph Bambara, Oracle Press.

Reference Books:	
1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Pearson Education
3)	Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions Gregor Hohpe, Bobby Woolf, Publisher: Addison Wesley
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech (IT) Semester - I	Subject : Machine Learning	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work:25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) Introduces fundamental concepts and methods for machine learning

2) Familiarize with basic learning algorithms and techniques and their applications

Course Prerequisites:

Students should be familiar with logic, elementary probability theory, elementary linear algebra, and multivariable calculus

Course Outcome:

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Students will be able to:

1) Understand regression

2) Understand basic probability theory

3) Understand estimation and classification techniques

4).Understand Bayesian and Monto Carlo methods

5).Understand concepts of Lagrange multipliers and Clustering

6) Understand Hidden Markov Models

UNIT-I		**(08 Hours)**
	Introduction to Machine Learning: Types of Machine Learning, A simple problem. Linear Regression: The ID case, Multidimensional inputs, Multidimensional outputs. Non Linear Regression: Basis function regression, Over fitting and Regularization, Artificial Neural Networks, K-Nearest Neighbors.	

	Quadratics: Optimizing a quadratic.	
UNIT-II		**(08 Hours)**
	Basic Probability Theory: Classical logic, Basic definitions and rules, Discrete random Variables, Binomial and Multinomial distributions, Mathematical expectations. Probability Density Functions(PDFs): Mathematical expectation, mean, and variance, Uniform distributions, Gaussian distributions: Diagonalization, Conditional Gaussian Distribution.	
UNIT-III		**(08 Hours)**
	Estimation: Learning a binomial distribution, Bayes' Rule, parameter estimation: MAP, ML, and Bayes' Estimates, Learning Gaussians, MAP nonlinear regression. Classification: Class Conditionals, Logistic Regression, Artificial Neural Networks, K-Nearest Neighbor Classification, generative vs. Discriminative models, Classification by LS Regression, Naïve Baye's: Discrete Input Features, Learning, Gradient Decsnt: Finite differences.	
UNIT-IV		**(08 Hours)**
	Cross Validation, Bayesian methods: Bayesian Regression, Hyperparameters, Bayesian model Selection. Monte Carlo Methods: Sampling Faussians, Importance Sampling, Markov Chain Monte Carlo (MCMC). Principal Components Analysis: The model and learning, Reconstruction, Properties of PCA, Whitening, Modelling, Probabilistic PCA.	
UNIT-V		**(08 Hours)**
	Lagrange Multipliers: Examples, Least-Squares PCA in one-dimension, Multiple constraints, Inequality constraints. **Clustering:** K-means Clustering, K-medoids Clustering, Mixtures of Gaussians: Learning, Numerical issues, the Free Energy, proofs, Relation to K-means, Degeneracy. Determining the number of clusters.	
UNIT-VI		**(08 Hours)**
	Hidden Markov Models: Markov Models, Hidden Markov Models, Viterbi Algoriyhm, The Forward Algorithm,	

Assignment List:	
1)	**To study and implement K-Nearest neighbor algoritm**
2)	**Problems solving on Probability density functions and Gaussian distribution**
3)	**Solving problems related to classification and estimation**
4)	**Solving problems related to Bayesian method and Monte Carlo methods**
5)	**To study and implement K-means clustering**

6)	**Comparison of various Hidden Markov Models**
Text Books:	
1)	Ÿ Kononenko, “Machine Learning And Data Mining: Introduction to Principles and Algorithms”, Horwood Publishing
2)	Kevin Patrick Murphy, “Machine Learning: a Probabilistic Perspective”, MIT Press
Reference Books:	
1)	Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997
2)	**Michael Berry & Gordon Linoff, “Mastering Data Mining”, John Wiley & Sons**
3)	Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, “Data Mining: A Knowledge DiscoveryK. Approach”, Springer
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech (IT) Semester - I Subject : MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Total Credits : 04**

Course Objectives:

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

Course Prerequisites:

Students should have knowledge of

Computer Networking & communication system

Course Outcome:

Students will be able to:

1) Understand mobile cellular architecture.
2) Understand the multiple access schemes & IEEE802.11
3) Analyze the technology channel interference in path propagation.
4) Understand the technology switching and traffic system.
5) Analyze the GSM System.
6) Understand the technology HEPERLAN & Android system.

UNIT-I	**Introduction to Mobile Communication**	**(Hours)**
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	**Multiple Access Schemes**	**(Hours)**
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	**Propagation Path Loss and Propagation Models**	**(Hours)**
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	**Switching and traffic**	**(Hours)**
	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and	08

	mobility management.	
UNIT-V	**Practical Cellular Mobile system-GSM**	**(Hours)**
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers.**CDMA:** Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	**Wireless Local Area Networks**	**(Hours)**
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. **Introduction to Android** Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08

Text Books:	
1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
2)	Jochen Schiller, "Mobile Communication" Pearson Education Ÿ
3)	V. K. Garg, J. E. Wilkes, "Principle and Application of GSM", Pearson Education
Reference Books:	
1)	V. K. Garg, "IS-95 CDMA &CDMA 2000", Pearson Education
2)	W. Frank Ableson,Robi sen, Chris King, " Android IN ACTION ", Third Edition, Dreamtech Press
3)	Mobile Computing By Rajkamal (Oxford).

Syllabus for Unit Test:	
Unit Test - 1	**Unit I ,II and III**
Unit Test - 2	**Unit IV, V and VI**

M.Tech (IT) Semester - I Subject: MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Total Credits : 04**

Course Objectives:
To gain an understanding of the principles behind the design of wireless communication systems and technologies.
Course Prerequisites:
Students should have knowledge of
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Course Outcome:
Students will be able to:
1) Understand mobile cellular architecture.
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5) Analyze the GSM System.
6) Understand the technology HEPERLAN & Android system.

UNIT-I	**Introduction to Mobile Communication**	**(Hours)**
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	**Multiple Access Schemes**	**(Hours)**
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	**Propagation Path Loss and Propagation Models**	**(Hours)**
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	**Switching and traffic**	**(Hours)**

	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and mobility management.	08
UNIT-V	**Practical Cellular Mobile system-GSM**	**(Hours)**
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers.**CDMA:** Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	**Wireless Local Area Networks**	**(Hours)**
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. **Introduction to Android** Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08

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1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
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Reference Books:	
1)	V. K. Garg, "IS-95 CDMA &CDMA 2000", Pearson Education
2)	W. Frank Ableson,Robi sen, Chris King, " Android IN ACTION ", Third Edition, Dreamtech Press
3)	Mobile Computing By Rajkamal (Oxford).

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester II											Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18
Subjects	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme (Marks)**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/ assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/ PR/ OR**	
Research Foundation	04	--	60	20	10	10	--	--	04	--	04
Information Retrieval	04	02	60	20	10	10	25	25	04	01	05
Real Time Systems	04	--	60	20	10	10	--	--	04	--	04
Information Security	04	02	60	20	10	10	25	25	04	01	05
Total	**16**	**04**	**240**	**80**	**40**	**40**	**50**	**50**	**16**	**02**	**18**

M.Tech IT Semester II	Subject: Research Foundation	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
	Continuous assessment : 40 Marks	**Total Credits : 04**

Course Objectives:

1) Assist students in planning and carrying out research projects, further research oriented studies or jobs

2) The students are exposed to the principles, procedures and techniques of implementing a research finding.

3) Students involve with finding out the literature using information technology / computer technology and with using the tools for data analysis in various sectors, and writing the reviews, papers, reports and thesis.

Course Prerequisites:

Students should have knowledge of

1) Problem definition

2) Project Preparation and publications

3) Mathematical and Statistical Analysis

Course Outcome:

Students will be able to:

1) Define and describe the research, research process and research methods.

2) Understand and apply research methods including design, data analysis, and interpretation.

3) Project Report, and Research Paper writing

UNIT-I	**Research Idea**	**(Hours)**
	Introduction to research. Research: objectives, motivation, types, approaches, methods and methodology. Research and scientific method.	08
UNIT-II	**Research Processes**	**(Hours)**
	How research is done, research processes, research criteria, research problem definition, problem selection, need of defining the problem, techniques involved in defining a problem.	08
UNIT-III	**Research Design**	**(Hours)**
	Research design: idea, why research designs, characteristics of design, types of designs, experimental design.	08
UNIT-IV	**Novelty**	**(Hours)**
	Novelty and Originality in Research: Resources, skills, time management, role of supervisor and research scholar, interaction with subject experts.	06
UNIT-V	**Paper, Thesis and Report Writing**	**(Hours)**
	Thesis Writing: Title, Abstract, Introduction, Literature review / previous works, Methodology, Result / Data analysis, Comparisons	08

	with earlier works, Conclusion, Future Scopes and References (IEEE / Springer / ACM / Elsevier formats). Importance of literature review, source of literature: books, journals, proceedings, thesis and dissertations, unpublished documents. On-line Searching: Database, SciFinder, Scopus, Science Direct, Searching research articles, Citation Index, Impact Factor, H-index.	
UNIT-VI	**Tools**	**(Hours)**
	Analytical tools, Introduction to data analysis, linear data and non-linear data, exponential type data, logarithmic type data, power function data and polynomials of different orders. Plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and Sigmoidal type data. Quantitative Techniques: Steps of quantitative analysis, reliability of the data, errors classification, accuracy, precision, statistical errors. LaTeX: Writing scientific report, research report, revision, writing project proposal, paper writing for international journals, conference presentation, Slides preparation, pictures, graphs and citation styles.	10

Assignment List:	
1)	Briefly describe the different steps involved in a research process. What do you mean by research? Explain its significance in modern times.
2)	Write short notes on: Design of the research project; Ex post facto research; Motivation in research; Objectives of research; Criteria of good research; Research and scientific method.
3)	Describe the different types of research, clearly pointing out the difference between an experiment and a survey.
4)	What is the necessity of defining a research problem? Explain.
5)	Explain the meaning of the following in context of Research design: (a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.
6)	Distinguish between an experiment and survey. Explain fully the survey method of research.
7)	Write short notes on the following: (a) Cross tabulation; (b) Discriminant analysis; (c) Coefficient of contingency; (d) Multicollinearity; (e) Partial association between two attributes.
8)	5. Distinguish between the following:

	(a) Statistic and parameter; (b) Confidence level and significance level; (c) Random sampling and non-random sampling; (d) Sampling of attributes and sampling of variables; (e) Point estimate and interval estimation. 7. 8. In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.
9)	(a) 500 articles were selected at random out of a batch containing 10000 articles and 30 were found defective. How many defective articles would you reasonably expect to find in the whole batch? (b) In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.
10	"We can teach methods of analysis, yet any extensive research... requires something equally important: an organisation or synthesis which provides the essential structure into which the pieces of analysis fit." Examine this statement and show how a good research report may be prepared.
Text Books:	
1)	C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
2)	P. Oliver, Writing Your Thesis, New Delhi: Vistaar Publications, 2004.
Reference Books:	
1)	R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
2)	F. Mittelbach and M. Goossens,The LATEX Companion, 2nd. ed. Addison Wesley, 2004.
3)	J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3nd. ed. Sage Publications, 2008.
4)	Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
5)	B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis,2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
6)	Gregory, Ethics in Research, Continuum, 2005.
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II	Subject : Information Retrieval	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination Marks 60**	**Theory :04**
Practical :02	**Continuous assessment Marks 40**	**Practical : 01**
	Term Work:25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) To provide students with an overview of the main principles and methods underlying the domain of Information Retrieval.

2) To address more recent developments in IR such as collaborative filtering and Latent Semantic Indexing.

Course Prerequisites:

Students should have knowledge of

1) Basic basic information retrieval techniques.

2) Data Structures and Algorithm Analysis

Course Outcome:

Students will be able to:

1) Understand the impact on web of information retrieval.

2)) Understand basic information retrieval models.

3) understand experimental evaluation of information retrieval

4) understand information retrieval implementation in search engines

5) understand language-model based retrieval

6) understand Information Extraction and Integration

UNIT-I	**Introduction**	**(Hours)**
	Goals and history of IR. **IR Basics**: inverted index, query and document representations, boolean retrieval, simple tf/idf and other ranking schemes. The impact of the web on IR. Information behavior, browsing vs seeking, types of search	08
UNIT-II	**Basic IR Models**	**(Hours)**
	Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. **Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval**: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation.	08

UNIT-III	Experimental Evaluation of IR	(Hours)
	Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections. **Query Operations and Languages**: Relevance feedback; Query expansion; Query languages. **Text Representation**: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML).	08
UNIT-IV	**Web Search**	**(Hours)**
	Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents. **Text Categorization**: Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization.	08
UNIT-V	**Language-Model Based Retrieval**	**(Hours)**
	Using naive Bayes text classification for ad hoc retrieval. Improved smoothing for document retrieval. **Text Clustering**: Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to web search and information organization.	08
UNIT-VI	**Recommender Systems**	**(Hours)**
	Collaborative filtering and content-based recommendation of documents and products. **Information Extraction and Integration**: Extracting data from text; semantic web; collecting and integrating specialized information on the web.	08

Assignment List:	
1)	Study impact of Information retrieval on web
2)	Write a program to implement TF-IDF to rank data
3)	Write a program to normalize the data
4)	Write a program to analyze indexer
5)	Write a program to analyze recall and F-measure top 3 popular search engines.
6)	Analyze working of open source crawlers.
7)	Implement naïve bayes algorithm to retrieve the data
8)	Write a program to implement k-means algorithm.
9)	Write a program to design dynamic forms for collaborative filtering

10)	Write a program to to collect feedback using various recommendation techniques
Text Books:	
1)	Introduction to Information Retrieval, by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2008
Reference Books:	
1)	Search Engines: Information Retrieval in Practice by W. Bruce Croft, Donald Metzler, and Trevor Strohman
2)	Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schutze, Cambridge University Press. 2008
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II	**Subject : Real Time Systems**	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	
		Total Credits : 04

Course Objectives:		
1) The aim of the course is to introduce the student to the theory of formal verification methods and techniques used for real time systems.		
2) This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in Real Time System.		
Course Prerequisites:		
Students should have knowledge of		
1)Basic understanding of C.		
2) Basic understanding of Computer Architectures.		
3) Basic understanding of Operating Systems		
Course Outcome: Real time system is one of class of f complex systems whose performance must be analyzed at the earlier phases of development. The methods and techniques in this course are widely used now a day in industries for these verifications of Real Time System. The students would have then a strong background of modeling, simulation and verification..		
Students will be able to:		
1) Clearly differentiate the different issues that arise in soft and hard real-time systems. Explain the various concepts of time that arise in real-time systems.		
2) Understand basic multi -task scheduling algorithms and approaches for scheduling.		
3) Understand basic for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling.		
4)Able to understand the desired language characteristics of real time programming languages.		
5) Clearly differentiate the Real Time Vs Gerenal – Purpose Databases.		
6)Understand the real time communication.protocols.		
UNIT-I	**Introduction**	**(08 Hours)**
	Real time Applications,Hard Versus Soft Real Time Systems, A reference model of Real Time Systems ,Issues in Real-Time Computing, Structure of real time systems, Task Classes, characterizing Real -Time Systems: Performance Measures for Real Time Systems., Estimating Program Run Times	
UNIT-II	**Real Time Scheduling**	**(08 Hours)**
	Approaches to Real Time Scheduling : Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach **Scheduling** : Introduction, Classical Uniprocessor Scheduling - Rate Monotonic scheduling Algorithm,Preemptive Earliest Deadline First(EDF) Algorithm **Uniprocessor scheduling of IRIS tasks-**Identical Linear Reward Functions,Nonidentical Reward Functions,0/1 Reward Functions,Identical	

	Concave Reward Function, Non identical Concave Reward Function,	
UNIT-III	**Task Assignment**	**(08 Hours)**
	Utilization Balancing Algorithm,A Next – Fit Algorithm for RM Scheduling,A Bin – Packing Assignment Algorithm for EDF,A Myopic Offline Scheduling (MOS) Algorithm,The Buddy Startegy,Assignment and Precedence Conditions.	
UNIT-IV	**Programming Languages and Tools**	**(08 Hours)**
	Introduction,Desired language characteristics,Data Typing,Control Structures,Facilitating Hierarchical Decomposition,Packages,Run Time Error Handling,Multitasking,Task Scheduling,Timing specifications,Experimental Languages:Flex,Euclid **Run Time Support:**Compiler,Linker,Debuuger,Kernel	
UNIT-V	**Real Time Databases**	**(08 Hours)**
	Introduction,Real Time Vs Gerenal – Purpose Databases,Main memory databases,Transaction Priorities,Transaction Aborts,Concurrency Control Issues,Disk Scheduling Algorithm,A Two-Phase Approach to improve predictability,Mainaining serilalisation Consistency,Databases for Hard real Time systems.	
UNIT-VI	**Real Time Communication**	**(08 Hours)**
	Introduction,Model Of Real Time Communication,Priority based Service Disciplines for switched network,Weighted Round Robin service disciplies,Medium Access control protocols of Broadcast networks,Real Time Protocols,Communication in multicomputer systems	

Text Books:

1)	C.M.Krishna,Kang G.Shin “Real Time Systems”,Tata McGraw Hill Edition
2)	Jane W.S.Liu,”Real Time Systems” Pearson Educatio

Reference Books:

1)	Real-Time Systems: Theory and Practice Kindle Edition by Rajib Mall

Syllabus for Unit Test:

Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II Subject :Information Security		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 Hrs/week	**End Semester Examination : 60 Marks**	**Theory: 04**
Practical :02 Hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks	**Total Credits:05**
	Prat/Oral : 25 Marks	

Course Objectives:

- Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management.

• Provide hands on approaches will be discussed to better understand and to devise strategies related to security policy.		
Course Prerequisites:		
Students should have knowledge of		
1 Fundamentals of Telecommunication and computer networks.		
Course Outcome:		
Students will be able to:		
1) Understand mathematical formulation in security algorithms.		
2) Understand aspect of information security management including planning, process, policy, procedure and security model as well as hardware and software technologies to safeguard organizational assets.		
3) develop skills of security management progression within an organization.		
4) Perform email and graphic image recovery as well as investigations.		
5) Implement cryptography algorithms.		
6) Learn business continuity planning concepts.		
UNIT-I	**MATHEMATICAL FOUNDATIONS OF INFORMATION SECURITY :**	**(6 Hours)**
	Topics in elementary number theory: O and Ω notations ,Euclidean algorithm ,Congruence's, Euler's phi function , Fermat's Little Theorem , Chinese Remainder Theorem , Applications to factoring ,finite fields , quadratic residues and reciprocity: Quadratic residues ,Legendre symbol , Jacobi symbol. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Block ciphers, Use of Block Ciphers, Multiple Encryption, Stream Ciphers, Affine cipher, Vigenere, Hill, and Permutation Cipher, Secure Cryptosystem.	
UNIT-II	**SECURITY ELEMENTS:**	**(6 Hours)**
	Authorization and Authentication - types, policies and techniques - Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Polices and Procedures, Firewalls, IDS, Log Files, Honey Pots .Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training , Email and Internet use policies, Third Party Development - Intellectual Property Issues .	
UNIT-III	**INFORMATION SECURITY POLICIES: INDUSTRIES PERSPECTIVE:**	**(6 Hours)**
	Introduction to Information Security Policies, About Policies, why Policies are Important ,When policies should be developed , How Policy should be developed - Policy needs – Identify what and from	

	whom it is being protected , Data security consideration, Backups, Archival storage and disposal of data - Intellectual Property rights and Policies – Incident Response and Forensics - Management Responsibilities – Role of Information Security Department.	
UNIT-IV	**SECURITY THREATS :**	**(6 Hours)**
	Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning.	
UNIT-V	**PUBLIC KEY CRYPTOSYSTEMS:**	**(6 Hours)**
	The idea of public key cryptography, RSA Cryptosystem , Bit security of RSA , ElGamal Encryption , Discrete Logarithm , Knapsack problem , Zero-Knowledge Protocols . Primality and Factoring: Pseudo primes , the rho (γ) method , Format factorization and factor bases ,the continued fraction method , the quadratic seieve method. Number Theory and Algebraic Geometry: Elliptic curves, basic facts , elliptic curve cryptosystems , elliptic curve primality test ,elliptic curve factorization.	
UNIT-VI	**AUDITING AND BUSINESS CONTINUITY PLANNING**	**(6 Hours)**
	: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware,Security testing tool BackTrack, Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.	

Assignment List:

1.	Assume a web-based system that has a state-less front-end web server (which just processes requests as it is with no state being tracked), an application engine (such as a Java servlet engine) that receives requests forwarded by the front-end, and a database that is used store/retrieve/manage data by the application engine. The application engine hosts application for a bank. The web-based system allows for a user to carry out online transactions, online viewing of accounts as well as other common tasks. (a) What types of logging mechanisms should be used for the front-end, the application engine, and for the database in order to audit the requests received, their processing, and the privilege modes/user ids in which requests are processed. (b) What auditing should such a system support?

2.	Pretend you've just seen a new type of malware that places the malicious code in an audio file, by using different frequencies to correspond to different instructions. Existing vulnerabilities are used to get access to the system and install a small interpreter that reads the infected audio files and executes them. Assume that you are unable to detect/prevent the interpreter (and that it doesn't do anything harmful by itself anyway) - your job is to detect or prevent it from executing malicious audio files. (a) List one or more ways you could *detect* an infected audio file. Provide a brief (one paragraph) description of each approach.
3.	Write a program to perform substitution ciphers to encrypt the explain text to Caesar cipher and to decrypt it back to plain text.
4.	Write a program to generate Symmetric Keys for the following Cipher algorithms DES, AES, Blowfish, TripleDES.
5.	Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption: a.RSA b.AES c.DSA
6.	Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Simple Columnar technique.
7.	Assignment based on the presentation on either of following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools ElGamal Encryption Asymmetric Cryptosystems
8.	Case study on secure configuration of Email Server.

Text Books:	
1)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2nd Edition, Springer, 2002.
2)	Johannes A. Buchman, "Introduction to Cryptography", 2nd Edition, Springer, 2004.
3)	Serge Vaudenay, "Classical Introduction to Cryptography – Applications for Communication Security", Springer, 2006.
4)	Victor Shoup, "A Computational Introduction to Number Theory and Algebra", Cambridge University Press, 2005.
5)	William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
6)	Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.
Reference Books:	
1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective

	Information Security Management (Paperback) Auerbach,1st edition, 2001
3)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2nd Edition, Springer, 2002.
4)	Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester III											Total Duration : 28 Hrs/Week Total Marks : 475 Total Credits : 40
Subject	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/ PR/ OR**	
Elective –I	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21
Seminar	-	05	-	-	**--**	**--**	25	25	-	05	05
Total	**12**	**16**	**180**	**60**	**30**	**30**	**100**	**75**	**12**	**28**	**40**

Elective – I	**Elective - II**
• Natural Language Processing & Understanding • Computer Forensics & Cyber Laws • Advanced MIS • Wireless Networks • Data Warehousing & E-Commerce	• Bio-informatics • Advanced Computer Architecture • Usability Engineering • Advanced Database Management • Advanced Operating System

M.Tech IT Semester III ELECTIVE I: Natural Language Processing And Understanding		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work :25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1. To understand natural language processing and to learn how to apply basic algorithms in this field.
2. To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.
3. To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language

Course Prerequisites:

Students should have knowledge of working of compiler phases

Course Outcome:

Students will be able to:

1. Evaluate language technology components.
2. Understand various parsing methodologies.
3. Understand various language models and relate them in probability perspective.
4. Map and solve the language parsing problem with dynamic programming.
5. Understand machine learning techniques and can assess which ones are suitable for a given problem.

UNIT-I	Introduction and Overview:	**(08 Hours)**
	Introduction, Overview and Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic analysis and Representation Structures, Natural Language Generation, Natural Language Systems, What is Natural Language Processing ?,Ambiguity and Uncertainty in language.	
UNIT-II	**Parsing and CFG:**	**(08 Hours)**
	String Edit Distance and Alignment: Key algorithmic tool: dynamic programming, First a simple example, its use in optimal alignment of sequences. String edit operations, edit distance, examples of use in spelling correction, machine translation. **Context Free Grammars:** Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing; Bottom-Up Parsing, and the Problems with each. Non-probabilistic model. **Parsing:** Efficient CFG parsing with CYK, another dynamic programming algorithm. Designing a little grammar and parsing with it on some test data.	

UNIT-III	**Information Theory :**	**(08 Hours)**
	What is information? Measuring it in bits. Entropy, cross-entropy, information gain. Its application to some language phenomena. **Language modeling and Naive Bayes:** Probabilistic Language modeling and its applications. Markov models. Estimating the Probability of a Word, and Smoothing. Generative models of language and their Application.	
UNIT-IV	**Hidden Markov Models :**	**(08 Hours)**
	Part of Speech Tagging and Hidden Markov Models : The concept of Parts-of-speech, Examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. **Viterbi Algorithm for Finding Most Likely HMM Path :** Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese Word Segmentation, Prosody, information extraction, Weighted Context Free Grammars. Weighted CYK. Pruning and Beam Search.	
UNIT-V	**Classifiers and Models:**	**(08 Hours)**
	Maximum Entropy: The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks. **Maximum Entropy Markov Models & Conditional Random Fields:** Part-of-speech tagging, Noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.	
UNIT-VI	**Machine Translation:**	**(08 Hours)**
	Probabilistic models for Translating any Language into English. Alignment, translation, Language generation.	

Text Books:

1.	Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall.

Reference Books:

1.	Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2.	Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3.	Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

4.	Radford, Andrew et. al., Linguistics, an Introduction, Cambridge University Press, 1999.
	Assignment list :
1.	Implement part of a noisy-channel model for spelling correction.
2.	Write regular expressions that extract phone numbers and regular expressions that extract email addresses.
3.	Using Naïve Bayes algorithm classify selected movie review as positive or negative
4.	Build a maximum entropy Markov model (MEMM) for identifying person names in newswire text.
5.	Implement two translation models, IBM model 1 and IBM model 2, and apply these models to predict English word alignments.

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective - I Advanced MIS		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) Explain the changing organizational environment and the use of information technology to manage contemporary organizations

2) Identify the business impacts of business and social networking

3) Explain the technological foundations of information systems, i.e., hardware, software and telecommunications

Course Prerequisites:

Students should have knowledge of

1) Information System Management

2) System Analysis and design

3) Management information system

Course Outcome:

Students will be able to:

1) Explain the organizational context of information systems, including decision making and information processing concepts

2) Identify, conceptualize, and develop solutions to prepare conceptual design report

3) Based on conceptual system design the student should able to prepare detailed system design alongwith technological foundations of information systems, i.e., hardware, software,informationprocessing.

4).To understand implementation evaluation of system and pitfalls in MIS.

5).Identify applications of MIS in manufacturing sector.

6)Understand design of business systems using contemporary tools.

UNIT-I	**Introduction:**	**(08 Hours)**
	Foundation of Information System : Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, MIS organization within company, Management information and the systems approach. **Information Technology:** A manager's overview, managerial overviews, computer hardware & software, DBMS, RDBMS and Telecommunication.	
UNIT-II	**Conceptual System Design:**	**(08 Hours)**
	Define the problems, set systems objective, establish system constraints, determine information needs, determine information sources, develop alternative conceptual design and select one document ,the system concept, prepare	

	the conceptual design report.	
UNIT-III	**Detailed System Design :**	**(08 Hours)**
	Inform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose and organization to operate the system, document the detailed design, revisit the manager user.	
UNIT-IV	**Implementation Evaluation and Maintenance of the MIS :**	**(08 Hours)**
	Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files , test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development.	
UNIT-V	**Advanced Concepts in Information Systems :**	**(08 Hours)**
	Enterprise Resources Management(ERP), Supply Chain Management, CRM, Procurement Management System. Applications of MIS in Manufacturing sector, Service sector	
UNIT-VI	**Designing of business systems :**	**(08 Hours)**
	Design of business systems using contemporary tools and methods such as SQL, CASE tools, OOD tools, etc. Advanced Case Studies in MIS.	

Text Books/Referemnce Books:

1)	Kenneth C. Laudon , "Management Information Systems", Eighth Edition, PHIŸ
2)	James O'Brien and George Marakas, "Management Information Systems
3)	Effy Oz, "Management Information Systems", Course TechEffy

Assignment List :

1)	**Introduction to MIS**
2)	**Generating conceptual system design report**
3)	Case study on detailed system design based on **conceptual system**
4)	**Implementation ,evaluation and maintainance of MIS.**

5)	Analysis of pitfalls in MIS developement
6)	**Case study of advanced concepts in information system.**
7)	To study applications of MIS in service sector.
8)	**Design of business system using contepoarary tools and methods such as SQL.**
9)	**Study of CASE tools and OOD tools.**
10	**Case study of lsoftware used for building information system.**

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective-I WIRELESS COMMUNICATION NETWORK		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week **Practical : 02 hrs/week**	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Practical :01**
	Term Work :25 Marks	**Total Credits : 05**
	Prat/Oral : 25 Marks	

Course Objectives:

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

Course Prerequisites:

Students should have knowledge of

…Computer Networking And Communication

Course Outcome:

Students will be able to:

1) Understand mobile cellular architecture.
2) Understand the multiple access schemes & Handover, Handoff system.
3) Analyze the technology digital celluare system.
4) Understand the technology WLAN ,Bluetooth.
5) Understand the GPRS System.
6) Understand the technology ADHOC & 802.16 system.

…

UNIT-I	**INTRODUCTION OF WIRELESS COMMUNICATION**	**(Hours)**
	Challenges in wireless networking, Wireless communications standards Overview, evolution of cellular system, Cellular system architecture & operation, Performance criteria. Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA	08
UNIT-II	**WIRELESS NETWORK PLANNING AND OPERATION**	**(Hours)**
	frequencies management, channel assignments, frequency reuse, System capacity& its improvement, Handoffs & its types, roaming, co channel & adjacent channel interference .	08
UNIT-III	**DIGITAL CELLULAR NETWORKS**	**(Hours)**
	GSM architecture& interfaces, signal processing in GSM, frame structure of GSM, Channels used in GSM, The European TDMA Digital cellular standard.	08
UNIT-IV	**WIRELESS LAN TECHNOLOGY**	**(Hours)**

	Overview, WLAN technologies, infrared LANs, Spread Spectrum LANs Narrowband Microwave LANs IEEE 802.11- Architecture, protocols, MAC layer .MAC frame, MAC management. **BLUETOOTH** Overview, Radio specification, Base band specification, Link manager specification, logical link control & adaptation protocol.	08
UNIT-V	**MOBILE DATA NETWORKS**	**(Hours)**
	Introduction, Data oriented CDPD networks, GPRS **WIRELESS ACCESS PROTOCOL** WAP architecture , Wireless Datagram ,Wireless Transport layer security, wireless transaction ,Wireless Session ,Wireless Application Environment ,WML	08
UNIT-VI	**Emerging Wireless Network Technology**	**(Hours)**
	IEEE 802.11 WLAN, ETSI HIPER LAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMANTechnology, Mobile Adhoc Network, Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology.	08

Text Books:	
1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
2)	Jochen Schiller, "Mobile Communication" Pearson Education Ÿ
3)	V. K. Garg, J. E. Wilkes, "Principle and Application of GSM", Pearson Education
Reference Books:	
1)	William Stalling," Wireless Communication & Networking"
2)	Rampantly," Mobile communication"
3)	Kamilo Feher," Wireless digital communication", PHI, 1999

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective –I DATA WAREHOUSING AND E-COMMERCE		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	**Total Credits : 5**
	Oral/Practical : 25 Marks	

Course Objectives:

1) Techniques for Developing Proper Data Warehouses

2)Analyze the E-Commerce Payment Mechanism and Risk

3) Recognize the business impact and potential of e-Commerce

Course Prerequisites:

Students should have knowledge of

1) Information Systems

Course Outcome:

Students will be able to:

1) Understand the analysis Decision Support System, Types and architecture.

2) Understand and analyze process for Development of DSS.

3) To understand Data Warehouse Concept and database.

4) To understand E-Commerce & Third Parties

5) To understand Risk and E-Commerce Payment Mechanism

6)To understand E-Commerce payment mechanism

UNIT-I		**(Hours)**
	Types of Decision Support System: The DSS hierarchy, Generalising the categories, Matching the DSS to the Decision type, Individual and group DSS. Matching the DSS to the user Community, Matching DSS to the decision Maker's Psychological type, User modes institutional Vs ad-hoc DSS. DSS Architecture, Hardware and Operating Systems Platform: Defining the DSS Arch. The major options, the internet and client-server computing in DSS, DSS using shared data on separate system, DSS on stand alone system, Open system and DSS, DSS user interface. DSS Software Tools: DSS software categories, standard packages, Specialized tools and generators, programming languages for DSS, DSS user interfaces	08
UNIT-II		**(Hours)**
	Building & Implementing Decision Support System: The DSS development process, DSS development project particulars. The implementation stage, system conversion. Overcoming resistance to change, DSS implementation issues, using the list of issues, Ethical issues in DSS.	08

UNIT-III	Data Warehousing & Executive Information System Fundamentals: Definitions uses & necessity of a data warehousing, Data warehouse concepts, Executive information systems. The Data Warehouse Database: Contents of the data warehouse database, database structures, and Getting data into data warehouse, Media.	**(Hours)**
		08
UNIT-IV	E-Commerce & The Role of Independent Third Parties: Introduction, consulting parties & accountant's independence, CPA version project, New assurance project, New assurance services undefined by the AICTE the Elliot committee 7 the Cohen Committee, three views of E-Commerce. E-commerce integrity & security assurance, internal control framework, competition, risk assessment assurance, impact of e-commerce on the traditional assurance function, continuous auditing, third party assurance of web based e-commerce, security of data, business plitics, transactions processing integrity, privacy of data, web-site seal options, better business bearu. Trustee, veri-sign, ACSA, AICPA/CICA web trust, business practices, transaction integrity, information protection, report issuance, implication for the accounting, professional skill sets, expansion of assurance services, consulting and international services	**(Hours)**
		08
UNIT-V	E-Commerce & Internet: Introduction, traditional EDI system, the origin of EDI, non-EDI systems, value added network(VANS) and pre-established trading partners, partially integrated EDI systems, benefits of EDI systems, Data transfer and standards, Department of Defense transaction,. Examples, financial EDI, EDI systems and Internets, Security concerns, security of data during transmission, audit trials and acknowledgements, authentication, interact trading relationship; consumer to business, business to business, government to citizen benefits, EDI web browser transaction, software, insights EDI and internet systems. Real time EDI inventory links with suppliers, integrated delivery links with federal express, web based sales, Impact of EDI internet applications on the accounting profession, Increased complexity of auditing through the computer, integrity of reliance in the VANs, Extension of audit to trading partners systems, increased technological skill of smaller accounting firms.	**(Hours)**
		08
UNIT-VI	Risk of Insecure Systems: Introduction, Overview of risks associated with internet transactions, internet associated risks, risks of customers, false or malicious web sites, stealing visitor's hard id, & passwords, stealing visitor's credit card and information, spying on visitor's hard drive, theft of customer data from selling	**(Hours)**

	agents and ISPs, Privacy and use of cookies, risk to selling agents, customer impersonation, denial of service attacks, data theft, internet associated risks, sabotage by former employees, snuffers, financial fraud, down loading of data, emails proofing, social engineering, risks associated with business transaction data transferred between trading partners, intranet extranet and internet relationship, data interception, message origin authentication, proof of delivery, message integrity & unauthorized viewing of messages, timely delivery of messages, risk associated with viruses and malicious code overflows, viruses, Trojan Horses, hoaxes, buffer overflows, implication for the accounting profession, intranet internet controls web site assurance. E-Commerce Payment Mechanism: Introduction, the SET protocol. SET v/s SSI, version 1.0, payment gateway, Certificate Insurance, Certificate trust chain, Cryptography methods, Dual signature, the set logo, Compliance testing, Status of software implementation, version 2.0, and intermediate releases, magnetic strip cards, smart cards, Electronic cheques, The FSTC's electrons cheques, the FSTC's BIPS specification, audit implications, Electronic bill presentation & payment system.	
		08

Assignment List:	
1)	What is Decision Support System? Explain Types of Decision Support System.
2)	Case Study: DSS Software Tools
3)	Explain Building & Implementing Decision Support System
4)	Case Study: Trustee, veri-sign, ACSA, AICPA/CICA web trust
5)	Explain EDI, non-EDI systems, value added network (VANS) with example.
6)	What are the types of digital wallets? Explain
7)	Relationship-Based Smart Credit Cards
Text Books and References::	
1)	Efrem G. Mallach, “Decision support & data warehouse system”, MGH International
2)	Green Stein, FeinMan , “Electronic Commerce”, MGH International
3)	W.S.Jawadekar, “Management Information System”, MGH International
4)	Daniel Minoli, “Web Commerce technology handbook”, MGH International
5)	Mathews Leon, “The E-biz Primer- Alexis Leon”, MGH International
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective I: Computer Forensics and Cyber Laws		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits: 05
	Pract/Oral : 25 Marks	

Course Objectives:
1) Computer Forensics is a rapidly changing field. Simple things, like stronger encryption introduced into operating systems, create new challenges for forensic examiners every day.

Course Prerequisites:
Students should have knowledge of
1) Practical experience of Computer Network and Network Security

Course Outcome:
Students will be able to:
1) Know the role of computer as forensic investigator
2) Know techniques for recovering data, tools used for recovery
3) setting up remote logging in Windows
4) Apply data recovery mechanism with the help of tools.
5) Analyze the security audit with the help of logs
6) Apply copyreight protection standard to the innovative network

UNIT-I	Overview:	(08 Hours)
	Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device. Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.	
UNIT-II	Evidence:	(08 Hours)
	Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence. Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team. Data Recovery: Definition of data recovery, data recovery mechanism, techniques for recovering data, tools used for recovery.	
UNIT-III	Investigating Logs:	(08 Hours)
	Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event	

	reporter and Application Logs.	
UNIT-IV	Forensic Tools:	(08 Hours)
	WinHex, X-Ways, Index.dat Analyzer, Data Doctor. Disaster Recovery: Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.	
UNIT-V	Battling Cyber Squatters and Copyright Protection in the Cyber World :	(08 Hours)
	Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy	
UNIT-VI	Digital Signature, Certifying Authorities and E-Governance :	(08 Hours)
	Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India.	

Assignment List:	
1)	Analyze various types of storage structures
2)	Understand line of investigation in the form of steps
3)	Analyze life cycle of evidence for security
4)	Apply data recovery mechanism with the help of tools.
5)	Analyze the security audit with the help of logs
6)	Analyze WinHex in detail
7)	Apply disaster recovery techniques to preserve data
8)	Apply copyreight protection standard to the innovative network.

Text Books/References:	
1)	Jay A. Siegel, “Forensic Science: The Basics “
2)	Joe Nickell and John F. Fischer, “Crime Science: Methods of Forensic Detection”
3)	Anthony J. Bertino, “Forensic Science: Fundamentals and Investigations”
4)	Stuart H. James and Ph. D., Jon J. Nordby, “Forensic Science: An Introduction to Scientific and Investigative Techniques”, 2nd edition
5)	Colin Evans, “The Casebook of Forensic Detection: How Science Solved 100 of the

	World's Most Baffling Crimes”
6)	Edward Amoroso, “Cyber Security, Computer Network Security and Cyber Ethics”, 2nd edition by Joseph Migga Kizza
7)	Robert McCrie, “Security Operations Management”, Second Edition Andy Jones and Debi Ashenden, “Risk Management for Computer Security:
8)	Andy Jones and Debi Ashenden, “Risk Management for Computer Security

Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective II: BIOINFORMATICS		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	
	Oral/Practical : 25 Marks	**Total Credits : 05**

Course Objectives:

1. Receive an introduction and historical perspective to the field of bioinformatics
2. Learn the key methods and tools used in bioinformatics
3. Understand the theoretical basis behind bioinformatics
4. Analyze protein sequences, identify proteins, and retrieve protein structures from databases. View and interpret these structures.

…

Course Prerequisites:

Students should have knowledge of

1) Advanced Molecular Biology (or equivalent)

…

Course Outcome:

Students will be able to:

1) Understand the Basic concepts of Bioinformatics
2) Understand and analyze Sequence Alignment and Database Searching
3) To understand Protein Structure
4) To understand Protein-protein Interactions and Algorithms.
5)To understand Protein function and Computer tools for phylogenetic analysis

UNIT-I	Bioinformatics Basics: Basic concepts, Protein and amino acid , DNA & RNA, Sequence, structure and function. Bioinformatics databases: Introduction, Motivation, Type of databases, Nucleotide sequence databases, Protein sequence databases, Sequence motif databases, Protein structure databases, Other relevant databases.	(08 **Hours)**
UNIT-II	Sequence Alignment and Database Searching: Single sequence alignments, Biological motivation, Pairwise alignments, Scoring matrix, Gap penalty, Dynamics programming, Needleman- Wunsch, Smith-Waterman, Heuristic methods, FASTA, BLAST, Statistics of sequence alignment score, E-Value, P-Value, Multiple sequence alignments, ClustalW, Profile, Profile-sequence	(08 **Hours)**

	alignment, Profile-profile alignment, PSI-BLAST, Hidden Markov Models. Protein structure alignments : Structure superposition, structure alignment, Different structure alignment algorithms.	
UNIT-III	Protein Structure: Protein secondary structure predictions: Protein secondary structure, Hydrogen bond, secondary structure element, Methods for predicting secondary structure. Protein tertiary structure modeling: Basic concepts Protein folding and dynamic simulation, Comparative modeling, Threading, Ab initio modeling, Combined modeling approaches, CASP: A blind protein structure prediction competition. Experimental methods for protein structure determination: X-ray crystallography, Nuclear magnetic resonance (NMR).	(08 **Hours)**
UNIT-IV	Protein-protein Interactions: Experimental identification of protein-protein interactions, Yeast two- hybrid assay, High-throughput mass spectrometry, Interaction networks and system biology. Protein quaternary structure modeling: Basic concepts, Degrees of freedom, Presentation of protein conformations, Hydrophobicity factor, Shape complementary, Docking Scoring function, Protein-protein docking algorithms, Protein-ligand docking algorithms, Drug design, Multiple-threading algorithms, Homology modeling of protein-protein interactions, Protein and ligand binding, CAPRI.	(08 **Hours)**
UNIT-V	Biomolecular Simulations: Basic concepts, Units and derivatives , Force field and energy landscape, Truncation of nonbonded interactions. Conformational Sampling: Introduction, Minimization and algorithms, Molecular dynamics, Ensembles (statistical mechanics), Monte Carlo simulations.	(08 **Hours)**

	Solvation: Introduction, Periodic boundary condition, Ewald summation, Implicit solvent model and continuum electro statics, Monte Carlo simulation on parallel computers. Advanced Techniques: Introduction, Replica-exchange simulations, Restraint potentials, Free energy calculations, Membrane simulations.	
UNIT-VI	Biological Membranes: Introductions, Biological roles, Structural features, Membrane lipids, General structures, Aggregation states, Polymorphism, Thermal transitions, Electrostatic effects, Molecular dynamics, Membrane proteins, MD simulation of Membrane proteins. Protein function: Sequence to function, Structure to function, Protein function identification methods and databases. Phylogenetics, Sequence-based taxonomy, Models, assumptions, and interpretations, From multiple alignment to phylogeny, Computer tools for phylogenetic analysis.	**(**08 **Hours)**

Assignment List:	
1)	Explain Bioinformatics Basics.
2)	Explain concept of Sequence Alignment and Database Searching.
3)	Explain Protein Structure and Protein quaternary structure modeling
4)	Explain Bio-molecular Simulations.
5)	Explain Conformational Sampling.
6)	Explain in detail Biological Membranes.
7)	Explain Protein function with examples.

Text Books and References::	
1)	David Mount, “Bioinformatics”, Cold Spring Harbor Press”
2)	James Jisdall, “Beginning Perl for Bioinformatics”
3)	David W. Mount, “Bioinformatics- Sequence & Genome Analysis”

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective – II Advanced Computing Architecture		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week **Practical : 02 hrs/week**	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Practical : 01**
	Term Work : 25 Marks	**Total Credits : 05**
	Practical / Oral : 25 Marks	

The aim of the course is to design distributed computing architecture to improve the efficiency of system.

Course Objectives:

1) Analyze the structure of distributed computing

2) Apply the efficient solution with respect to suitable distributed computing Architecture.

Course Prerequisites:

Students should have knowledge of

2) Basic knowledge of distributed system

Course Outcome:

Students will be able to:

1) Understand distributed environment.

2) Analyze performance of distributed Architectures

3) Analyze the computing parameters.

4)Understand data and computing measures

5) Analyze bottlenecks during the enhancement

6) Apply the suitable architecture to enhance the performance.

UNIT-I	**Introduction to cloud computing**	**(Hours)**
	Introduction to to various distributed computing architectures – Grid, cluster, cloud. Structure of cloud, computing parameters of cloud, boost in the performance due to cloud.	06
UNIT-II	**Architecture of cloud computing**	**(Hours)**
	Service Models – Infrastructure As a Service (IaaS) , Platform as a Service (PaaS), Software as a Service (SaaS) Deployment Models – Public cloud, private cloud, Hybrid cloud, community cloud	06
UNIT-III	**Big Data**	**(Hours)**
	Concept of Big Data, Challenges to deal with Big Data , solution with respect to big data, data Analytics.	06
UNIT-IV	**Data Intensive Computing**	**(Hours)**
	Introduction to hybrid data, concept of Hadoop Distributed	06

	File Structure (HDFS), data node, name node, job tracker, Task Tracker.	
UNIT-V	**Architecture of Map Reduce Algorithm**	**(Hours)**
	Concept of unstructured data, Introduction to Map Reduce Algorithm, Implementation with word count example.	06
UNIT-VI	**Case Study of advanced computing Architecture**	**(Hours)**
	Cloudstack, Eucalyptus, Azure, big data analytics, Hadoop,Implementation of MapReduce -II	06

Assignment List:	
1)	**Design cluster using apache web server**
2)	**Design cloud computing environment using public cloud**
3)	**Design cloud computing environment using private cloud**
4)	**Analyse the Complete data of BVUCOE using big data analytics**
5)	**Use HDFS to deal with huge data.**
6)	**Implement Map Reduce Algorithm to prove the rise in the efficiency**
7)	**Implement Map Reduce II**
8)	**Analyze various computing environments like cloudstack , openstack.**
Text Books:	
1)	**Architecture the cloud, Michael J. Kevis, Wiley publication**
2)	**Microsoft Big Data Solution, Adam Jorgensen, Wiley publication**
3)	**Hadoop: The Definitive Guide, Tom White, O'REILLY' publication**
Reference Books:	
1)	**Building the Infrastructure for cloud security, Raghu Yelori, Enrique castro-Leon**
2)	**Hadoop Operations, Eric Sammer, O'REILLY' publication**
3)	**MapReduce Design Patterns: Building Effective Algorithms and Analytics Donald Miner, O'REILLY' publication**
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective II: Usability Engineering		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	**Total Credits: 05**
	Pract/Oral : 25 Marks	

Course Objectives:

1) To present the basic principles and practical knowledge regarding the design, development and evaluation of human-computer interfaces in the light of usability

Course Prerequisites:

Students should have knowledge of

2) Practical experience of software system analysis and design

Course Outcome:

Students will be able to:

2) Define and distinguish between the different types of user interface

2) Develop a more usable interface

3) To identify techniques and technologies that can satisfy usability and accessibility specifications

4) To apply usability methods in developing interactive systems

5) To identify and analyze the various components of the overall context of use of an interactive system

6) To develop usability and accessibility specifications that can be used in evaluating and developing interactive systems-

UNIT-I	**Introduction**	**(08 Hours)**
	Introduction, Importance, Human computer interface, Characteristics of GUI, Direct manipulation graphical system, Web user interface, Mobile UI, Popularity of graphics **Generations of User Interfaces:** Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces	
UNIT-II	**Development Processes**	**(08 Hours)**
	Managing Design Processes: Organizational Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues **Evaluating Interface Designs:** Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	

UNIT-III	**User Interface Software and Specifications**	**(08 Hours)**
	Languages and tools for specifying and building interfaces, Dialogue independence, UIMS (user interface management system) approach, Languages and software abstractions for user, interfaces, Programming support tools	
UNIT-IV	**Develop System Menus and Navigation Schemes**	**(08 Hours)**
	Menus: Structures, Functions, Content, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of Graphical Menus **Windows:** Window Characteristics, selection of window, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, Web Systems	
UNIT-V	**Interaction Styles, Devices and Techniques**	**(08 Hours)**
	Interaction Styles: Question and answer, Form-based, Command language Menus, Natural language, direct manipulation **Interaction Devices**: Keyboard and function keys, pointing device, speech recognition digitization and generation, image and video displays, drivers **New Interaction Techniques:** New modes of human-computer communication, Voice, Gesture, Eye movement, Tangible, user interfaces, Brain-computer interfaces	
UNIT-VI	**UI Feedback, Guidance and Assistance**	**(08 Hours)**
	Providing the Proper Feedback: Response Time, Dealing with Time Delays, Blinking for Attention, Use of Sound **UI Guidance and Assistance:** Preventing Errors, Problem Management, Providing Guidance and Assistance, Instructions or Prompting, Help Facility	

Assignment List:	
1)	Introduction to fundamentals of Usability Engineering
2)	Study on User Interface Software and Specifications
3)	Design a sport watch interface
4)	Design a web application interface for online grocery shopping
5)	Design a touch screen interface for an Automatic Teller Machine (ATM) geared towards kids aged 10-15 whose parents have opened a savings account for them
6)	Design an interface and list user experience for a universal remote to be used in home settings

Text Books:	
1)	Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, *Designing the User Interface:*

	Strategies for Effective Human-Computer Interaction, Addison-Wesley, Reading, Mass. (any recent edition)
2)	Y. Rogers, H. Sharp, and J. Preece, *Interaction Design: Beyond Human-Computer Interaction,* John Wiley & Sons. (any recent edition)
Reference Books:	
1)	Don Norman, *The Design of Everyday Things*
2)	Jakob Nielsen, *Usability Engineering*
3)	Jakob Nielsen and Raluca Budiu, *Mobile Usability*
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective II: Advanced Database Management System		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks **Prat/oral : 25 Marks**	**Total : 05**

Course Objectives:

1) Introduce principles and foundations of distributed databases and parallel databases

2) Understand the operations in Transaction management

Course Prerequisites:

Students should have knowledge of

1)Basic database management system concepts and their operations.

Course Outcome:

Students will be able to:

1) Understand distributed database architecture and design

2) Understand the processing and optimization of distributed queries

3) Understand the performance issues in high performance databases

4) Understand the working of parallel database management system

5) Understand the transaction management process

6) Understand latest advancement in database management systems

UNIT-I	**Distributed databases: Architecture and Design**	**(Hours)**
	Distributed data processing,What is a DDBS; Advantages and disadvantages of DDBS, Problem areas Distributed DBMS Architecture: Transparencies in a distributed DBMS,Distributed DBMS architecture, Global directory issues, Distributed Database Design: Alternative design methodologies and strategies, Distributed design issues, Types and role of Fragmentation, Types and role of replication, Data allocation	08
UNIT-II	**Distributed query processing and optimization**	**(Hours)**
	Distributed Query processing: Problem of query processing, Distributed query, Query decomposition, Distributed Query Processing Methodology, translation global queries to fragment	08

	queries Distributed Optimization: Objectives of query optimization, Factors governing query optimization, Ordering of fragment queries, optimization of join operation, Load balancing, Distributed query optimization algorithms	
UNIT-III	**Issues and Concerns in High Performance Databases**	**(Hours)**
	Database Tuning and Performance: benchmarking, TPC benchmarks, object oriented benchmarks, TP Monitors, TPC and Wisconsin benchmarks, performance measurement, and performance tuning. Semantic data Control : View management, Data security, Semantic Integrity Control Indexing structures: Btrees, hash files, multi-attribute indexing.	08
UNIT-IV	**Parallel Database Management System**	**(Hours)**
	Introduction: Types of parallelism in database systems, Parallel Query Processing, multiprocessor architectures, parallel relational operators, parallelism in main-memory DBMS, parallel handling of integrity constraints, Integrated I/O parallelism Parallel Query Processing and Optimization: Inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, objectives of parallel query optimization, parallel query optimization, load balancing, parallelism in join queries, testing the quality of query optimization	08
UNIT-V	**Advanced concepts in Transaction Management**	**(Hours)**
	Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management and their algorithms, Recovery Methods Concurrency control and Reliability in Distributed Dtabases: Concurrency control in centralized database systems vs Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management, Reliability issues in DDBSs; Types of failures, Reliability techniques, Commit protocols, Recovery protocols	08
UNIT-VI	**Emerging trends in databases**	**(Hours)**
	Mobile Databases, Distributed Object Management, Multi-databases, Semantic databases, Hadoop Distributed File Systems, MapReduce Overview, NoSQL Databases, Design and Comparison of NoSQL Databases, Active and Deductive databases	08

Assignment List:	
1)	**To study and implement different types of Views in SQL**
2)	**Study and implementation of all types of Joins using SQL**
3)	**Implementation of hash files**
4)	**Study of transaction and implementing transaction operations using SQL/PL-SQL**
5)	**Installation and study of Hadoop.**
6)	**Installation and study of any NoSQL database**
7)	**Comparison and Implementation of locking techniques**
8)	**Case study of the operations of any real time distributed DBMS and parallel DBMS**
Text Books:	
1)	Stefano *Ceri and* Giuseppe *Pelagatti,* "Distributed databases principles and systems", Tata Hill
2)	Raghu Ramkrishnan, "Database Management System", McGraw-Hill
3)	Silberschatz, Korth and Sudharshan, "Data base System Concepts", Mc-GrawHill
Reference Books:	
1)	M. Tamer Özsu and Patrick Valduriez, "Principles of Distributed Database Systems", Springer Science & Business Media, 2011, 3rd edition
2)	Elmasri and Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2007
3)	Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management ",Pearson Education, LPE
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective-II- Advanced Operating Systems		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical :02	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work :25 Marks	
	Prat/Oral :25 Marks	**Total Credits : 05**

Course Objectives:

1) To provide students with an overview of operating systems with change in technologies and use

Course Prerequisites:

Students should have knowledge of

1) Basic concepts of operating systems.

2) Basic algorithms in operating systems.

Course Outcome:

Students will be able to:

1)Understand core structure of operating systems

2)) Understand distributed operating systems.

3) Understand distributed resource management.

4) Understand multiprocessor and database operating systems.

5) Understand real time and mobile operating systems.

UNIT-I	INTRODUCTION	**(Hours)**
	Overview – Functions of an Operating System – Design Approaches – Types of Advanced Operating System – Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs – Process Deadlocks – Preliminaries – Models of Deadlocks, Resources, System State – Necessary and Sufficient conditions for a deadlock – Systems with Single-Unit Requests, Consumable Resources, Reusable Resources.	08
UNIT-II	DISTRIBUTED OPERATING SYSTEMS	**(Hours)**
	Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport's Logical Clock; Vector Clock; Casual Ordering Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport's Algorithm – Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock Detection Algorithms – Distributed Deadlock-Detection Algorithms, Agreement Protocols – Classification – Solutions – Applications.	08

UNIT-III	DISTRIBUTED RESOURCE MANAGEMENT	**(Hours)**
	Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols – Design Issues, Distributed Scheduling – Issues – Components - Algorithms	08
UNIT-IV	FAULT RECOVERY AND FAULT TOLERANCE	**(Hours)**
	Basic Concepts – Classification of Failures- Basic Approaches to Recovery; Recovery in Concurrent Systems; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues – Two phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.	08
UNIT-V	MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS	**(Hours)**
	Structures – Design Issues – Threads –Processing Synchronization – Process Scheduling – Memory Management – Reliability / Fault Tolerance; Database Operating Systems –Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms.	08
UNIT-VI	REAL TIME AND MOBILE OPERATING SYSTEMS	**(Hours)**
	Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.	08

Assignment List:
1)Study of hardware and software requirements of different operating systems
2) Implement CPU scheduling policies.
3)Implement Lamport's Algorithm – Token-Based Algorithm
4) Implement Suzuki-Kasami's Broadcast Algorithm
5) Study of distributed file systems – architecture
6)Study of fault recovery and fault tolerance
7) Implement file storage allocation techniques.
8) Study of Concurrency Control Algorithms.

9) Case study of mobile operating systems	
10) Case study of real time operating systems	
Text Books:	
1)	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2)	Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
Reference Books:	
1)	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2)	Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
3)	Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech Information Tecnology

Semester IV									Total Duration : 14 Hrs/Week Total Marks : 325 Total Credits : 34		
Subject	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/ assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/PR/OR**	
Self-Study Paper-II	04	--	60	20	10	10	-	-	**04**	**-**	**04**
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
Total	**04**	**10**	**60**	**20**	**10**	**10**	**150**	**75**	**04**	**30**	**34**

List Of Self Study Subjects

Sr. No.	Self Study Paper I Sem-III	Self Study Paper II Sem-IV
1	Real Time & Fault Tolerant System	Information Storage and Management
2	Ad-hoc Network	Organizational Behavior
3	Computer Oriented Numerical & Statistical Methods	Computer Vision and Digital Image Processing
4	Semantic Networks	Artificial Intelligence & Applications
5	Embedded System and Applications	Design and Analysis of Algorithms
6	Distributed Computing	Compiler Design
7	Information Theory Coding and Cryptography	Computer Oriented Optimization Techniques
8	Soft Computing	Information Security System

M.Tech(IT) Sem-III

Self Study Paper I - Real Time & Fault Tolerant System

Teaching Scheme	Examination Scheme
Lecture:-04 Hours Per Week	Theory : 60Marks
	Internal Assement : 40 Marks
	Total Credits : 04

Unit-I Structure of Real Time System (08 Hrs)

: Performance Measure for real time system, Task Assignments, Fault Tolerant Scheduling, Real Time Vs General purpose Data Bases, Data Bases for Hard Real Time System, Real Time Communication

Unit-II Fault Tolerance(08 Hrs)

Fault-Error-Failure. Redundancy, Error Detection, Damage Confinement, Error Recovery, Fault Treatment, Fault Prevention, anticipated and unanticipated Faults.Error models: General coding scheme Error detection techniques: Watchdog processors, Heartbeats, consistency and capability checking, Data audits, Assertions, Control-flow checking, Error control coding. Application: DHCP

UNIT III Fault -Tolerance Techniques (08 Hrs)

:Introduction, failure causes, fault types, fault detection, fault and error containment, redundancy, data diversity, reversal checks, malicious or Byzantine failures, integrated failure handling.Coding technique-fault tolerant self checking and fail safe circuits- fault tolerance in combinatorial and sequential circuits- synchronous and asynchronous fail safe circuits.Software fault tolerance: Process pairs, robust data structures, N version programming, Recovery blocks, Replica consistency & reintegration, multithreaded programs Application: VAX. Network fault tolerance: Reliable communication protocols, Agreement protocols, Database commit protocols -Application: Distributed SQL server Check pointing & Recovery - Application: Micro check pointing, IRIX Checkpoints

UNIT IV Experimental Evaluation (08 Hrs)

Modelling and simulation based, Fault injection based - Application, NFTAPE fault injector . Modelling for performance, dependability and perform ability: dependability-specific methods (fault trees, reliability block diagrams), queues, stochastic Petrinets and stochastic activity networks - Application: Ultra SAN/NAS

UNIT V Reliability & Clock Synchronization: Introduction, obtaining parameter values, reliability models for hardware redundancy, software error models, taking time into account, clock synchronization, nonfault-tolerant synchronization algorithms, impact of faults, fault tolerant synchronization in hardware.

UNIT VI Practical Systems for Fault Tolerance (08 Hrs)

Application: Ad-hoc wireless network - Application: NASA Remote Exploration & Experimentation System Architecture: Fault tolerant computers -general purpose commercial systems-fault tolerant multiprocessor and VLSI based communication architecture.**Fault tolerant software:**Design-N-version programming recovery block - acceptance tests-fault trees- validation of fault tolerant systems.

Reference Books: :-

1. K.K.Pradhan, “Fault Tolerant computing theory and techniques” volume III. Prentice Hall, 1989.
2. Krishna, Real Time System, TMH
3. Anderson and Lee, “Fault Tolerant principles and practice” ,PHI 1989.
4. Siewert, Real Time Embeded System, Cengage Learning.
5. Rajiv Mall, Real Time System, Pearson Edu.
6. Parag K. Lala, “Fault Tolerant and Fault Testable, Hardware design” PHI 1985.
7. Shem , toy Levei , Ashok K.Agarwala , “Fault Tolerant System design”, Tata McGraw Hill

Self Study Subject – I Ad-Hoc Networks

TEACHING SCHEME

Lectures: 04 Hrs / Week
Credits: 04
Internal Assessment: 40 Marks

EXAMINATION SCHEME

Theory : 60 Marks
Duration: 03 Hours

UNIT I :

Introduction to Wireless Networks: Evolution of Mobile Cellular Networks, Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Personal Communications Services (PCSs), Wireless LANs (WLANS), Universal Mobile Telecommunications System (UMTS), IMT2000, IS-95, CDMA One and CDMA 2000 Evolution. Origins of Ad Hoc: Packet Radio Networks: Introduction, Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Routing in PRNETs, Route Calculation, Pacing Techniques, Media Access in PRNETs, Flow Acknowledgments in PRNETs.

UNIT II :

Ad Hoc Wireless Networks: Introduction, Heterogeneity in Mobile Devices, Wireless Sensor Networks, Traffic Profiles, Types of Ad Hoc Mobile Communications, Types of Mobile Host Movements, Challenges Facing Ad Hoc Mobile Networks. Ad Hoc Wireless Media Access Protocols: Introduction, Problems in Ad Hoc Channel Access, Receiver-Initiated MAC Protocols, Sender-Initiated MAC Protocols, Existing Ad Hoc MAC Protocols, MARCH: Media Access with Reduced Handshake.

UNIT III:

Overview of Ad Hoc Routing Protocols: Table-Driven Approaches, Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Cluster Switch Gateway Routing (CSGR), Source-Initiated On-Demand Approaches, Ad Hoc On-Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Signal Stability Routing (SSR), Location-Aided Routing (LAR), Power-Aware Routing (PAR), Zone Routing Protocol (ZRP), Source Tree Adaptive Routing (STAR), Relative Distance Micro diversity Routing (RDMAR)

UNIT IV :

Communication Performance of Ad Hoc Networks: Introduction, Performance Parameters of Interest, Route Discovery (RD) Time, End-to-End Delay (EED) Performance, Communication Throughput Performance, Packet Loss Performance, Route Reconfiguration/Repair Time, TCP/IP-Based Applications

UNIT-5

TCP Over Ad Hoc: Introduction to TCP, Versions of TCP, Problems Facing TCP in Wireless Last-Hop, Problems Facing TCP in Wireless Ad Hoc, Approaches to TCP over Ad Hoc. Internet & Ad Hoc Service Discovery: Resource Discovery in the Internet, Service Location Protocol

(SLP) Architecture, SLPv2 Packet Format, JINI, Salutation Protocol, Simple Service Discovery Protocol (SSDP), Service Discovery for Ad Hoc, Ad Hoc Service Location Architectures.

UNIT-6

Ad Hoc Nomadic Mobile Applications, In the Office, While Traveling, Arriving Home, In the Car, Shopping Malls, The Modern Battlefield, Car-to-Car Mobile Communications, Mobile Collaborative Applications, Location/Context Based Mobile Services.

Reference Books:

1) Ad Hoc Mobile Wireless Networks: Protocols and Systems, By: C.-K. Toh, Publisher: Prentice Hall
2) Ad Hoc and Sensor Networks – Theory and Applications, By Carlos De Morais, Publisher World Scientific Publications
3) Ad Hoc Wireless Networks – Architecture and Protocols, C. Siva Ram Murthy, Publisher Pearson Education

M.Tech (IT) Sem III

Self Study Paper I – Computer Oriented Numerical & Statistical Method

TEACHING SCHEME
Lectures : 04 Hrs/Week

EXAMINATION SCHEME
Theory : 60 Marks
Internal Assessment : 40 Marks
Credits : 04

Unit-I **(08 Hours)**

Introduction

Numbers and Their Accuracy, Computer Arithmetic, Mathematical Preliminaries, Errors & Their Computation, General Error Formula, Error in a Series Approximation.

Unit II **(08 Hours)**

Solution of Algebraic & Transcendental Equation

Bisection Method, Iteration Method, Method of False Position, Newton-Raphson Method, Methods of Finding Complex Roots, Muller's Method, Rate of Convergence of Iterative Methods, Polynomial Equations.

Unit-III **(08 Hours)**

Interpolation

Finite Differences, Difference Tables Polynomial Interpolation**:** Newton's Forward & Backward Formula Central Difference Formulae: Gauss Forward & Backward Formula, Stirling's Bessel's, Everett's formula. Interpolation With Unequal Intervals: Langrange's Interpolation, Newton Divided Difference Formula, Hermite's Interpolation.

Unit-IV **(08 Hours)**

Numerical Integration & Differentiation

Introduction, Numerical Differentiation Numerical Integration: Trapezoidal Rule, Simpson's 1/3 and 3/8 rule, Boole's Rule, Waddle's Rule.

Unit-V **(08 Hours)**

Solution of Differential Equations

Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta Methods, Predictor Corrector Methods, Automatic Error Monitoring & Stability of Solution.

Unit-VI **(08 Hours)**

Statistical Computation

Frequency Chart, Curve Fitting by Method of Least Squares, Fitting Of Straight Lines, Polynomials, Exponential Curves, Data Fitting with Cubic Splines, Regression Analysis, Linear & Non Linear Regression, Multiple Regression, Statistical Quality Control Methods.

Text Books / References

- Rajaraman V, “Computer Oriented Numerical Methods”, Pearson Education.
- Gerald & Whealey, “Applied Numerical Analyses”, AW.
- Jain, Iyengar and Jain, “Numerical Methods for Scientific and Engineering Computations”, New Age Int.
- Grewal B S, “Numerical methods in Engineering and Science”, Khanna Publishers, Delhi.
- T Veerarajan, T Ramachandran, “Theory and Problems in Numerical Methods, TMH.
- Pradip Niyogi, “Numerical Analysis and Algorithms”, TMH.
- Francis Scheld,” Numerical Analysis”, TMH.
- Sastry S. S, “Introductory Methods of Numerical Analysis”, Pearson Education.
- Gupta C.B., Vijay Gupta, “Introduction to Statistical Methods”, Vikas Publishing.
- Goyal M, “Computer Based Numerical and Statistical Techniques”, Firewall Media, New Delhi.

Syllabus for Unit Test

Unit Test I	Units I, II & III
Unit Test II	Units IV, V & VI

M Tech (IT) Sem-III

Self Study Paper –I: Semantic Network

Teaching Scheme	Examination Scheme
Lecturers: 4 Hrs/ week	**Theory: 60 Marks**
	Internal Assessment: 40 marks
	Credits-: 04

UNIT –I Overview Of semantic network

Defination of semantic network. Directed or undirected graph. Terms used in semantic network vertices, concepts, edges, label, and arcs.Common semantic relations. Form of knowledge representation. Cognitively based semantic networks. Semantic network as a frame network.

UNIT –II Inheritance in Semantic Network

ISA Links, Multiple Inheritances, Conflict properties, Conflict resolution strategies, Representing events, Representing predicates, Representing Relations.

UNIT –III Frames in Semantic Network

Terms used in frames Entity, attributes, associated values. Demons. Features of Frame Representations.

UNIT –IV Issues in Semantic Network

Comparative issues in Knowledge Representation. Expressiveness of semantic Nets.

UNIT –V Application

WordNet, Gellish models, semantic representation of natural language expressions and used in several Natural language processing applications, plagiarism detection.

UNIT –VI Tools

SNePS , MultiNet, plagiarism tools, tools used for lexical knowledge engineering

References

John F. Sowa "Semantic Networks".

John F. Sowa, Alexander Borgida *Principles of Semantic Networks: Explorations in the Representation of Knowledge*.

M.Tech (IT) Sem III
Self Study Paper I –Embedded System

TEACHING SCHEME
Lectures : 04 Hrs/Week

EXAMINATION SCHEME
Theory : 60 Marks
Internal Assessment : 40 Marks
Credits : 04

UNIT I INTRODUCTION **06 hrs.**

Embedded system- characteristics of embedded system- categories of embedded system- requirements of embedded systems- challenges and design issues of embedded system- trends in embedded system- system integration-

UNIT II HARDWARE & SOFTWARE PARTITION **04 hrs.**

- applications of embedded system- control system and industrial automationbiomedical- data communication system-network information appliances- IVR systems- GPS systems.

UNIT III DEVELOPMENT OF SOFTWARE ARCHITECTURE **10 hrs.**

Development of software architecture – simple round robin architecture- design and implementation of digital
multimeter- round robin with interrupt architecture- implementation of communication bridge- function queue scheduling
architecture- RTOS architecture.

UNIT IV HARDWARE ARCHITECTURE **10 hrs.**

Hardware architecture- block schematic of a typical hardware architecture- CPU-memeory-I/O Devices- design with microprocesors development-ADC- DAC interfacing LED/LCD interfacing. Case study of processor- 16 bit and 32 bit processor-DSP processor.

UNIT V EMBEDDED SYSTEM PLATFORM AND DEVELOPMENT TOOLS 1 0 hrs.

Inter process communication- UART-IEEE 1394-IRDA-USB-PCI development tools- EPROM ERASER-signature
validator- accelerated design for video accelerator.

UNIT VI OVERVIEW OF DESIGN TECHNOLOGIES **10 hrs.**

Design methodologies and tools- designing hardware and software components- system analysis and architecture
design- system integration- structural and behavioral description smart cards.

REFERENCE BOOKS:

1. Wayne wolf, “Computers as components”, Morgan Kaufmann publishers, 2nd Edition, 2008.
2. Jean J.Labrosse, “Embedded system building blocks”, CMP books, 2nd Edition, 1999.
3. Arnold berger, “Embedded system design”, CMP books, 1st Edition, 2001.
4. Narayan and gong, “Specifications and design of embedded systems”, Pearson education, 2nd Edition, 1999.

M.Tech(IT) Sem III

Self Study Paper I – Distributed Computing

Teaching Scheme:
Lecture:-04 Peer Week

Examination Scheme
Theory :60Marks
Internal Assement : 40 Marks
Total Credits : 04

UNIT I INTRODUCTION **(08 Hrs)**

Fundamentals of Distributed computing, system model, distributed operating system, designing operating system, Introduction to DCE ,Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies.

UNIT II PROCESSES AND DISTRIBUTED OBJECTS **(08 Hrs)**

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

UNIT III DISTRIBUTED TRANSACTION PROCESSING **(08 Hrs)**

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems

UNIT IV Remote procedure call **(08 Hrs)**

RPC model, Transparency of RPC, implementing RPC mechanism, Stub generation, Marshaling arguments and Results, Server Management, Parameter-passing Semantics , call Semantics, Communication protocols for RPCs, Complicated RPC Client server binding, Exception Handling , Security, special types of RPCs, RPCs in Heterogeneous Environments, Lightweight RPC, Optimizations
for better performance.

UNIT V Distributed Shared Memory **(08 Hrs)**

General architecture of DSM systems, Design and implementation of DSM, Granularity, structure of shared memory space, consistency models, Replacement Strategy, Thrashing, other approaches to DSM, Heterogeneous DSM, and Advantages of DSM, **Distributed Files Systems** Introduction, Features, Models, Accessing models; sharing Semantics & caching schemes, replication, Fault Tolerance, Atomic transactions.

UNIT VI Resource & process Management

Features of a good scheduling algorithm, Task assignment approach, Load balancing & load sharing approach, Introduction to process management, Process migration, Threads.

Text Books

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, 3rd Edition, 2002.
2. P.K.Singh –Distruibuted Computing

References

1. Sape Mullender, Distributed Systems, Addison Wesley, 2nd Edition, 1993.

2. Albert Fleishman, Distributes Systems- Software Design and Implementation, Springer-Verlag, 1994

3. M.L.Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.

4. Andrew S Tanenbaum , Maartenvan Steen,Distibuted Systems –Principles and Pardigms,Pearson Education, 2002

M Tech (IT) Sem-III

Self Study Paper –I: **Information Theory, Coding and Cryptography**

Teaching Scheme	**Examination Scheme**
Lecturers: 4 Hrs/ week	**Theory: 60 Marks**
	Internal Assessment: 40 marks
	Credits-: 04

UNIT I: - Information Theory

Uncertainty, Information, Entropy. Discrete Memoryless Channel. Mutual Information.Channel Capacity. Shannon's Theorems. Gaussian Channel. Limits to Communication.

UNIT II: - Linear Block Codes

Groups, Fields and Vector Spaces. Construction of Galois Fields of Prime Order. Syndrome Error Detection. Standard Array and Syndrome Decoding. Hamming Codes

UNIT III: - Cyclic Codes

Polynomial Representation of Codewords. Generator Polynomial. Systematic Codes. Generator Matrix. Syndrome Calculation and Error Detection. Decoding of Cyclic Codes.

UNIT IV: - Structure and Properties of Convolutional Codes

Convolutional Encoder Representation.Tree, Trellis, and State Diagrams.Distance Properties of Convolutional Codes.Punctured Convolutional Codes and Rate Compatible Schemes.Decoding of Convolutional Codes.Maximum Likelihood Detection.The Viterbi Algorithm.

UNIT V: - Introduction to Cryptography

History. Overview of cryptography. Simple classical cryptosystems. Cryptanalysis. Perfect Secrecy: - Information theoretic security.

UNIT VI: - Secret and Public Key Encryption

Description of DES. Description of AES (advanced encryption standard).Trapdoor Function. The RSA Algorithm

References

Information Theory Coding and Cryptography Ranjan Bose Tata McGraw-Hill Education

Jorge Castiñeira Moreira, Patrick Guy Farrell , Essentials of Error-Control Coding

Mtech IT Sem-III
Self Study Paper-I : SOFT COMPUTING

Teaching Scheme
Theory Hours: 04 Hrs/Week

Examination Scheme
Theory: 60 Marks
Class Test: 40 Marks
Credit:04

UNIT I [10 Hrs]

FUZZY SET THEORY

Introduction to Neuro , Fuzzy and Soft Computing , Fuzzy Sets – Basic Definition and Terminology , Set-theoretic Operations , Member Function Formulation and Parameterization , Fuzzy Rules and Fuzzy Reasoning , Extension Principle and Fuzzy Relations , Fuzzy If-Then Rules , Fuzzy Reasoning , Fuzzy Inference Systems , Mamdani Fuzzy Models , Sugeno Fuzzy Models , Tsukamoto Fuzzy Models , Input Space Partitioning and Fuzzy Modeling.

UNIT II [8 Hrs]

OPTIMIZATION

Derivative-based Optimization , Descent Methods , The Method of Steepest Descent , Classical Newton's Method , Step Size Determination , Derivative-free Optimization , Genetic Algorithms , Simulated Annealing , Random Search , Downhill Simplex Search.

UNIT III [08 Hrs]

NEURAL NETWORKS

Supervised Learning Neural Networks , Perceptrons - Adaline , Backpropagation Mutilayer Perceptrons , Radial Basis Function Networks , Unsupervised Learning Neural Networks , Competitive Learning Networks , Kohonen Self-Organizing Networks , Learning Vector Quantization , Hebbian Learning.

UNIT IV [08 Hrs]

NEURO FUZZY MODELING

Adaptive Neuro-Fuzzy Inference Systems , Architecture , Hybrid Learning Algorithm , Learning Methods that Cross-fertilize ANFIS and RBFN , Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V ,[08Hrs]

APPLICATIONS OF COMPUTATIONAL INTELLIGENCE

Printed Character Recognition, Inverse Kinematics Problems , Automobile Fuel Efficiency Prediction , Soft Computing for Color Recipe Prediction.

Reference Books

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004,

Pearson Education 2004.

2. Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
3. Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,1989.
4. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”,PHI, 2003.
5. R.Eberhart, P.Simpson and R.Dobbins, “Computational Intelligence - PC Tools”, AP Professional, Boston,1996.

Mtech IT Sem-IV

Self Study Paper-II : Information Storage and Management

Teaching Scheme
Theory Hours: 04 Hrs/Week

Examination Scheme
Theory: 60 Marks
Class Test: 40 Marks
Credit:04

UNIT-I **[08 Hrs]**

Introduction to Storage Technology:

Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

UNIT-II **[08 Hrs]**

Storage Systems Architecture:

Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,Iligh-level architecture and working of an intelligent storage system

UNIT-III **[08 Hrs]**

Introduction to Networked Storage:

Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN,Benefits of the different networked storage options, Understand the need for long-term archiving solutions and describe how CAS fulfill the need,Understand the appropriateness of the different networked storage options for different application environments

UNIT-IV **[08 Hrs]**

Information Availability & Monitoring & Managing Datacenter:

List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures,Architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Identify key areas to monitor in a data center, Industry standards

for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center

UNIT-V **[08 Hrs]**

Securing Storage and Storage Virtualization:
Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes.

Unit-VI **[08 Hrs]**

Information storage on cloud : Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud,Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

Reference books:

- EMC Corporation, Information Storage and Management, Wiley, ISBN number: 04702942134.
- Robert Spalding, "Storage Networks: The Complete Reference",Tata McGraw Hill,Osborne, 2003.
- Marc Farley, "Building Storage Networks",Tata McGraw Hill, Osborne. 2001.
- Meeta G. Somasundaram & Alok Shrivastava (EMC Education Services) editors; Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India.

- Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; StorageNetwork explained: Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.

- John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.

- Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.
- Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.

M Tech (IT) Sem-IV

Self Study Paper –II: Organizational Behaviour

Teaching Scheme	Examination Scheme
Lecturers: 4 Hrs/ week	Theory: 60 Marks
	Internal Assessment: 40 marks
	Credits-: 4

UNIT I. Introduction to Management: Meaning, nature and importance of management; Management functions; Co-ordination; Managerial skills; Principles of management; Major school of management thought: An overview.

UNIT II. Planning: Importance of planning; Types of plans; Planning and decision making process.

UNIT III. Organisation and Control: Process of organizing; Organisational structure and design-vertical and horizontal dimensions.

UNIT IV. Organisational Behaviour: introduction to organizational behaviour in management; Foundations of individual behaviour-personality; perception; learning; values, attitudes and job satisfaction; ability and motivation.

UNIT V. Group: Foundations of group behaviour; Communication and group decision making; Leadership: power and politics, conflict.

UNIT VI. Organization: Foundations of organization structure; Job design, work settings and job stress; Organizational culture: Meaning, importance and characteristics of organization culture. Organization Change and Development: Significance of change; Forces of change: Resistance to organizational change; Management of change Organization development: Concept, characteristics and assumptions; Goals, approaches and techniques of organization development.

References

1. Cook, Curtis, Phillip Hunsaker and Robert Coffey, Management and Organisation Behaviour, McGraw Hill Co., New York, 2000.

2. Griffin, Ricky W., Organisational Behaviour, Houghton Mifflin Co., Boston.

3. Hellreigel, Don, John W. Slocum, Jr., and Richard W. Woodman, Organizational Behaviour, South Western College Publishing, Ohio.

4. Hersey and Blanchard, Management of Organisational Behaviour: Utilising Human Resources, 7th ed., Prentice Hall of India Ltd., New Delhi.

M.Tech (IT) Sem IV
Self Study Paper II – Computer Vision And Digital Image Processing

Teaching Scheme:
Lecture:-04 Peer Week

Examination Scheme
Theory :60Marks
Internal Assement : 40 Marks
Total Credits : 04

UNIT I Introduction to Digital Image Processing & Computer Vision (08 Hours)

Digital Image, Image Processing origins; Imaging in X-Rays, ultraviolet, visible infrared, visible, microwave, and radio bands; Fundamentals of image processing; Components of image processing systems; Glossary of terms & definitions of Low level processing, Mid level analysis, High level understanding, Pattern recognition, Computer vision, Computer graphics.

UNIT II Digital Image Fundamentals (08 Hours)

Visual perception – human eye, brightness adaptation and discrimination, Electromagnetic spectrum; Image sensing and acquisition – single, strip and array sensors, Image formation models; Image sampling and quantization – basic concepts, representation of image, special and gray level resolution, aliasing, zooming and shrinking; Relationships between pixels – nearest neighbor, adjacency, connectivity, regions, and boundaries; Distance measures; Image operations on a pixel basis; Linear and nonlinear operations.

UNIT III Image Enhancement in the Spatial Domain (08 Hours)

Gray level transformations - image negatives, log, power-law and piecewise linear transformation functions; Histogram processing– equalization, matching; Enhancement operations - arithmetic, logic, subtraction and averaging; Spatial Filtering – linear & order-statistics for smoothing and first & second derivatives/gradients for sharpening;

UNIT IV Image Enhancement in the Frequency Domain (08 Hours)

2-D Fourier transform, its inverse and properties; Discrete and Fast fourier transform; Convolution and Correlation theorems; Filtering in frequency domain - low pass smoothing, high pass sharpening, homomorphic filtering.

UNIT V Image Compression: Background (08 Hours)

Coding redundancy (Huffman encoding & Decoding); Transformation methods in Image processing such as applications of Discrete Cosine Transform (DCT). Fast Wavelet Transform; Inverse Wavelet Transform: JPEG

UNIT VI Image Segmentation (08 Hours)

Point, Line and Edge detection; Line detection using Hough Transforms; Region-Based Segmentation; Segmentation using Watershed Transform;

Reference Books:

D.A.Forsyth and J. Ponce, COMPUTER VISION – A MODERN APPROACH, Prentice Hall.

Milan Sonka, Vaclav Hlavac and Roger Boyle, IMAGE PROCESSING, ANALYSIS AND MACHINE VISION, Chapman and Hall

Robert J. Schalkoff , DIGITAL IMAGE PROCESSING AND COMPUTER VISION, Wiley

Gonzalez and Woods, DIGITAL IMAGE PROCESSING, Addison Wesley

Arun D. Kulkarni, COMPUTER VISION AND FUZZY NEURAL SYSTEMS

M. Seul, L. O'Gorman, M.J. Sammon, PRACTICAL ALGORITHMS FOR IMAGE ANALYSIS: DESCRIPTIONS, EXAMPLES AND CODE, Cambridge University Press.

M Tech (IT) Sem-IV

Self Study Paper –II: **Artificial Intelligence and Applications**

Teaching Scheme	**Examination Scheme**
Lecturers: 4 Hrs/ week	**Theory: 60 Marks**
	Internal Assessment: 40 marks
	Credits-:0 4

UNIT-I: - General Issues and Overview of AI
The AI problems, what is an AI technique, Characteristics of AI applications. Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables, iteraction and recursion, property lists and arrays.

UNIT-II:-Problem Solving, Search and Control Strategies
General problem solving, production systems, control strategies forward and backward chaining, exhausive searches depth first breadth first search. Heuristic Search Techniques
Hill climbing, branch and bound technique, best first search & A* algorithm, AND / OR graphs, problem reduction & AO* algorithm, constraint satisfaction problems.
Case Studies

UNIT-III:-Knowledge Representations

First order predicate calculus, skolemization, resolution principle & unification, interface mechanisms, horn's clauses, semantic networks, frame systems and value inheritance, scripts, conceptual dependency.
Case Studies based on Knowledge Representation.

UNIT-IV:-**Natural Language processing**
Parsing techniques, context free grammer, recursive transitions nets (RNT), augmented transition nets (ATN), case and logic grammers, symantic analysis. Game playing. Minimax search procedure, alpha-beta cutoffs, additional refinments. Planning Overview an example domain the block word, component of planning systems, goal stack planning, non linear planning.

Case Study based on Natural Language Processing

UNIT-V:-**Probabilistic Reasoning and Uncertainty**
Probability theory, bayes theorem and bayesian networks, certainty factor.
Case Studies.

Expert Systems
Introduction to expert system and application of expert systems, various expert system shells, vidwan frame work, knowledge acquisition, case studies, MYCIN. Linking expert systems to other software such as DBMS, MIS, MDB. Expert System on Crop Prediction.

UNIT: –VI Applications
Neural Computing, Robotics. Learning Rote learning, learning by induction, explanation based learning.

BOOKS

1. Elaine Rich and Kevin Knight "Artifical Intelligence" - Tata McGraw Hill.
2. "Artifical Intelligence" 4 ed. Pearson.
3. Dan W. Patterson "Introduction to Artifical Intelligence and Expert Systems", Prentice India.
4. Nils J. Nilson "Principles of Artifical Intelligence", Narosa Publishing House.
5. Clocksin & C.S.Melish "Programming in PROLOG", Narosa Publishing House.
6. M.Sasikumar,S.Ramani etc. "Rule based Expert System", Narosa Publishing House.

M.Tech (IT) Sem IV

Self Study Paper II – Design & Analysis of Algorithm

TEACHING SCHEME
Lectures : 04 Hrs/Week

EXAMINATION SCHEME
Theory : 60 Marks
Internal Assessment : 40 Marks
Credits : 04

Unit I **(08 Hours)**

Basics of Algorithms & Data Types

Algorithms, Abstract Data Type, The Running Times of a Program, Time Space Tradeoff, Asymptotic Notations, Conditional Asymptotic Notation, Use of the Big O, Small o, Big Omega And Small Omega Notation.

Unit II **(08 Hours)**

Algorithms Analysis Techniques & Design Technique

Efficiency of Algorithms, Analysis of Recursive Programs, Solving Recurrence Equation.

Divide & Conquer Algorithms – Binary Search, Finding Maximum & Minimum, Merge Sort Multiplication of Large Integers and Stressen's Matrix Multiplication.

Greedy Algorithm – Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Method, Container Loading, Knapsack Problem, Huffman Tree.

Dynamic programming – General Method, Multistage Graphs, All-Pair Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, Warshall's and Floyd's Algorithm.

Backtracking – 8 Queens Problem, Subset-Sum Problem, Graph Coloring, Hamiltonian Problem, Branch & Bound, Assignment Problem, Travelling Salesperson Problem.

Unit III **(08 Hours)**

Trees & Sorting

Basic Terminology, Implementation of Tree, An Array Representation of Trees, Representation of Trees by List of Children, Binary Trees, Deterministic Selection & Sorting, Optimality Of Algorithms for Sorting & Selection, Randomized Algorithms Like Randomized Quick Sort, Expected Linear Time Randomized Selection.

Unit IV **(08 Hours)**

Algorithms for External Storage

A Model of External Computation, External Sorting, Characteristics of External Sorting, Criteria for Developing an External Sorting Algorithm, Important Uses of External Sorting, Merge Sort--A Digression, Top-Down Strategy, Bottom-Up Strategy, Storing Information in Files, Hashed Files, Indexed Files.

Unit V **(08 Hours)**

Memory Management

The Issues in Memory, Garbage Collection Algorithms for Equal-Sized Block, Collection in Place, Buddy System, Distribution of Blocks, Allocation Blocks, Returning Blocks to Available Storage, Storage Compaction & Compaction Problem.

Unit VI **(08 Hours)**

NP Complete Problem

Introduction to NP Problem, Polynomial Time, Abstract Problems, Encoding, NP-Completeness & Reducibility, NP-Completeness, Circuit Satisfiability, NP-Complete Problems, The Vertex Cover Problem, Approximation Algorithms for NP-Hard Problems.

Text Books / References

- Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press.
- K.S. Easwarakumar, "Object Oriented Data Structures using C++", Vikas Publishing House Pvt. Ltd.
- T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", Second Edition, Prentice Hall of India Pvt. Ltd.
- Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education.
- Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education.
- Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education.
- Horowitz E., Sahni S., Rajasekaran S, "Computer Algorithms", Galgotia Publications.
- R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai, "Introduction to the Design and Analysis of Algorithms A Strategic Approach", TMH.

Syllabus for Unit Test

Unit Test I	Units I, II & III
Unit Test II	Units IV, V & VI

M.Tech (IT) Sem -IV
Self Study Paper II –Compiler Design

TEACHING SCHEME
Lectures : 04 Hrs/Week

EXAMINATION SCHEME
Theory : 60 Marks
Internal Assessment : 40 Marks
Credits : 04

UNIT I:

Overview of Compilation:
Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation – LEX lexical analyzer generator.
Top down Parsing :
Context free grammars, Top down parsing – Backtracking, LL (1), recursive descent parsing, Predictive parsing, Preprocessing steps required for predictive parsing.

UNIT II:

Bottom up parsing :
Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing , handling ambiguous grammar, YACC – automatic parser generator.
Semantic analysis :
Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Conversion of popular Programming languages language Constructs into Intermediate code forms, Type checker.

UNIT III:

Symbol Tables :
Symbol table format, organization for block structures languages, hashing, tree structures representation of scope information. Block structures and non block structure storage allocation: static, Runtime stack and heap storage allocation, storage allocation for arrays, strings and records.

UNIT IV:

Code optimization :
Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation.

UNIT V:

Data flow analysis :
Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation.

UNIT VI:

Object code generation :
Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

REFERENCE BOOKS:
1. lex &yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3. Engineering a Compiler-Cooper & Linda, Elsevier.
4. Compiler Construction, Louden, Thomson.

5. Principles of compiler design -A.V. Aho . J.D.Ullman; Pearson Education.
6. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press.

TEACHING SCHEME

Lectures: 04 Hrs / Week
Credits: 04
Internal Assessment: 40 Marks

EXAMINATION SCHEME

Theory : 60 Marks
Duration: 03 Hours

Self Study – II: Computer Oriented Optimization Techniques

UNIT-I

Introduction: The beginning and progress of Operations Research (OR), Classifications of problems in OR, Mathematical Modeling in OR. **Dynamic Programming: Introduction, Investment problem,** Dynamic Programming solution of the general allocation problem, stagecoach problem, production scheduling, equipment replacement.

UNIT - II

Linear Programming: Introduction, Formulation of linear programming models, Maximization of less-than-or-equal-to constraints, equalities and greater- than-or-equal-to constraints, Minimization of the objective function, The simplex method, **Integer Programming**: Introduction, implicit enumeration, Cutting Plane Techniques. Branch and Bound Techniques and algorithms.

UNIT-III

Deterministic Inventory models: Introduction, infinity delivery rate and back ordering. Sequencing problems: Two machine sequencing problem, *n-Job,* Three machine sequencing problem. *Probabilistic Operations Research Models: Basic concepts of probability and statistics, Regression Analysis in details.*

UNIT-IV

Decision Theory, Game Theory, PERT and CPM Project management origin and use of PERT, origin and use of CPM, Applications of PERT and CPM, Project Network, Diagram representation, Critical path calculation by network analysis and critical path method (CPM), Determination of floats, crashing in project management, Project Evaluation and review Technique (PERT). Simulation, Markov Chains.

Reference Books:

1. Introduction To Operations Research: A Computer-Oriented Algorithmic Approach, Billy Gilett, Tata Mcgraw Hill Education.
2. Operations Research - An Introduction, Tata Hamdy, A, Fifth Edition, Prentice Hall of India Pvt. Ltd., New Delhi.

MTech IT (Sem IV)

Self Study Paper II – Information Security System

Teaching Scheme:
Lecture:-04 Peer Week

Examination Scheme
Theory :60Marks
Internal Assement : 40 Marks
Total Credits : 04

UNIT-I **(08 Hours)**

Introduction- Computer Security, Threats to security, History of Computer security, Computer System Security and Access Controls (System access and data access). Threats - Viruses ,worms , Trojan horse, bombs, trap doors, spoofs, email virus, macro viruses, remedies, Intruders, Malicious software, Firewalls, vulnerabilities & threats, Network Denial of service attack.

Security Attacks (Interruption, Interception, Modification and Fabrication), SecurityServices (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

UNIT-II **(08 Hours)**

Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC

UNIT-III **(08 Hours)**

Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service

UNIT-IV **(08 Hours)**

Email privacy: Pretty Good Privacy (PGP) and S/MIME.

UNIT-V **(08 Hours)**

IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management

UNIT-VI **(08 Hours)**

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security(TLS), Secure Electronic Transaction (SET), cloud computing security

TEXT BOOKS:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, wiley Dreamtech,

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Cryptography and network Security, Third edition, Stallings, PHI/Pearson

5. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
6. Introduction to Cryptography, Buchmann, Springer.

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY), PUNE

Faculty of Engineering And Technology
M. Tech - Information Technology
Old Syllabus

Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune

M. Tech (Information Technology)
(2015 CBCS COURSE)

Program Curriculum

VISION OF THE UNIVERSITY

Social Transformation through Dynamic Education

MISSION OF THE UNIVERSITY

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal and other deprived sections of the population

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be a leading Programme, transforming students into skilled IT professionals.

MISSION OF THE DEPARTMENT

• Amplify the student's technical skills by conducting continuing education

programs, organizing and participating in various technical events.

• Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.

• Provide an environment for effective social and ethical skills.

PROGRAMME OUTCOMES (POs)

After completing the M.Tech (Information Technology) programme, students acquire the ability to:

1) Identify research gaps and provide solutions to new ideas and innovations.
2) Design effective and efficient algorithms and codes
3) Apply software engineering principles and practices to provide solutions to complex software problems

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Department of Information Technology postgraduate program prepares students to

1) Apply knowledge of computing and technology to analyze, design and simulate to provide optimized solutions for Complex Problems
2) Enhance skills, adapt new computing technologies and contribute to research & development either through research or by practice.
3) Engage in Professional and ethical practices in multidisciplinary working environment.

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech Information Technology

Semester I											Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18
Subjects	Teaching Scheme (Hrs) Hrs./ Week		Examination Scheme (Marks)						Examination Scheme (Credits)		Total Credits
	L	P	Theory	Unit Test	Attendance	Tutorial/ Assignments	TW	Pract / Oral	TH	TW/PR/ OR	
Software Architecture	04	02	60	20	10	10	25	25	04	01	05
Machine Learning	04	02	60	20	10	10	25	25	04	01	05
Mobile Networks & Communication	04	--	60	20	10	10	--	--	04	--	04
Parallel Programming & Algorithms	04	--	60	20	10	10	--	--	04	--	04
Total	16	04	240	80	40	40	50	50	16	02	18

M.Tech (IT) Semester - I	Subject : SOFTWARE ARCHITECTURE	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work:25 Marks	**Total Credits : 05**
	Prat/Oral : 25 Marks	

The aim of the course is to design a system to provide the solution to the existing system
Course Objectives:
1) Analyze the problem in existing system.
2) Apply the efficient solution by wisely designing the architecture.
Course Prerequisites:
Students should have knowledge of
1) Basic knowledge of java programming.
…
Course Outcome:
Students will be able to:
1) Understand problems in existing system
2) Analyze feasibility of design proposed.
3) Analyze the technology suitable to build the proposed system.
4)Understand the use of design pattern to design the architecture
5) Analyze the adherence of solution with the requirement
6) Apply the efficient architecture to optimize the performance of the system
…

UNIT-I	**INTRODUCTION TO SOFTWARE ARCHITECTURE**	**(Hours)**
	Introduction to Software Architecture, Architecture of Business Cycle, software architecture requirements, Types of Architecture, Documenting software architectures, recent trends in software architectures.	06
UNIT-II	**DESIGN CONCERNS**	**(Hours)**
	Introduction to the issues in design, Considering important aspects during the design SRS, Cost, Security, Resources, Compatibility, Scalability, dependency. Selection of Technology according to the requirement.	06

UNIT-III	**DESIGN PATTERNS**	**(Hours)**
	Introduction to Design patterns, principles and expectations Types of design patterns Singleton, Factory, Adaptor, Facade, Proxy, Iterator, Observer, Mediator, composite. Rules and regulations to select design patterns.	06
UNIT-IV	**TECHNOLOGIS USED IN MIDDLEWARE**	**(Hours)**
	Types of Middleware, Application servers, Introduction to Java EE, Introduction to Java EE , JDBC, RPC, RMI, EJB Architecture, Entity, Session, Message beans, XML, XSLT. Specifications and characteristics of Middleware technologies. Recent advances in Middleware technologies.	06
UNIT-V	**N TIER ARCHITECTURE**	**(Hours)**
	Introduction to tiers in Architecture, Types of Tiers , XML, Client side technologies HTML, DHTML, Java Applets, ActiveX controls, DOM, AJAX. Client side technology in multi-tier architectures Examples of three tier and n-tier architectures, client side technologies.	06
UNIT-VI	**SERVER SIDE TECHNOLOGY**	**(Hours)**
	Multi-tier architectures, introduction to server side technologies: JSP, JSF, SOA, MVC. Java Servlets, introduction to framework struts, spring.	06

Assignment List:	
1)	**Design an architecture to solve collision problem in Traffic Signaling System**
2)	**Design generalized and specialized approach to simulate traffic signaling system.**
3)	**Implement all types of driver to connect front end with back end using modular approach.**
4)	**Implement and maintain cookies in a structured relational database.**
5)	**Implement data and page transfer using servlet.**
6)	**Implement library management system using JSP.**
7)	**Implement**
8)	**Implement CRUD functionality using MVC architecture with struts framework.**
Text Books:	
1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Pearson Publication
3)	OCM Java EE 6 Enterprise Architect Exam Guide (Oracle Press) by Paul Allen , Joseph Bambara, Oracle Press.

Reference Books:	
1)	Software Architecture in Practice, Second Edition By Len Bass, Paul Clements, Rick Kazman Publisher: Addison Wesley
2)	Agile Software Development, Principles, Patterns, and Practices, Robert C. Martin, Pearson Education
3)	Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions Gregor Hohpe, Bobby Woolf, Publisher: Addison Wesley
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech (IT) Semester - I	Subject : Machine Learning	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work:25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) Introduces fundamental concepts and methods for machine learning

2) Familiarize with basic learning algorithms and techniques and their applications

Course Prerequisites:

Students should be familiar with logic, elementary probability theory, elementary linear algebra, and multivariable calculus

Course Outcome:

..

Students will be able to:

1) Understand regression

2) Understand basic probability theory

3) Understand estimation and classification techniques

4).Understand Bayesian and Monto Carlo methods

5).Understand concepts of Lagrange multipliers and Clustering

6) Understand Hidden Markov Models

UNIT-I		**(08 Hours)**
	Introduction to Machine Learning: Types of Machine Learning, A simple problem. Linear Regression: The ID case, Multidimensional inputs, Multidimensional outputs. Non Linear Regression: Basis function regression, Over fitting and Regularization, Artificial Neural Networks, K-Nearest Neighbors.	

	Quadratics: Optimizing a quadratic.	
UNIT-II		**(08 Hours)**
	Basic Probability Theory: Classical logic, Basic definitions and rules, Discrete random Variables, Binomial and Multinomial distributions, Mathematical expectations. Probability Density Functions(PDFs): Mathematical expectation, mean, and variance, Uniform distributions, Gaussian distributions: Diagonalization, Conditional Gaussian Distribution.	
UNIT-III		**(08 Hours)**
	Estimation: Learning a binomial distribution, Bayes' Rule, parameter estimation: MAP, ML, and Bayes' Estimates, Learning Gaussians, MAP nonlinear regression. Classification: Class Conditionals, Logistic Regression, Artificial Neural Networks, K-Nearest Neighbor Classification, generative vs. Discriminative models, Classification by LS Regression, Naïve Baye's: Discrete Input Features, Learning, Gradient Decsnt: Finite differences.	
UNIT-IV		**(08 Hours)**
	Cross Validation, Bayesian methods: Bayesian Regression, Hyperparameters, Bayesian model Selection. Monte Carlo Methods: Sampling Faussians, Importance Sampling, Markov Chain Monte Carlo (MCMC). Principal Components Analysis: The model and learning, Reconstruction, Properties of PCA, Whitening, Modelling, Probabilistic PCA.	
UNIT-V		**(08 Hours)**
	Lagrange Multipliers: Examples, Least-Squares PCA in one-dimension, Multiple constraints, Inequality constraints. **Clustering:** K-means Clustering, K-medoids Clustering, Mixtures of Gaussians: Learning, Numerical issues, the Free Energy, proofs, Relation to K-means, Degeneracy. Determining the number of clusters.	
UNIT-VI		**(08 Hours)**
	Hidden Markov Models: Markov Models, Hidden Markov Models, Viterbi Algoriyhm, The Forward Algorithm,	

Assignment List:	
1)	**To study and implement K-Nearest neighbor algoritm**
2)	**Problems solving on Probability density functions and Gaussian distribution**
3)	**Solving problems related to classification and estimation**
4)	**Solving problems related to Bayesian method and Monte Carlo methods**
5)	**To study and implement K-means clustering**

6)	**Comparison of various Hidden Markov Models**
Text Books:	
1)	Ÿ Kononenko, “Machine Learning And Data Mining: Introduction to Principles and Algorithms”, Horwood Publishing
2)	Kevin Patrick Murphy, “Machine Learning: a Probabilistic Perspective”, MIT Press
Reference Books:	
1)	Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997
2)	**Michael Berry & Gordon Linoff, “Mastering Data Mining”, John Wiley & Sons**
3)	Cios, W. Pedrycz, R. Swiniarski, L. Kurgan, “Data Mining: A Knowledge DiscoveryK. Approach”, Springer
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech (IT) Semester - I Subject : MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Total Credits : 04**

Course Objectives:

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

Course Prerequisites:

Students should have knowledge of

Computer Networking & communication system

Course Outcome:

Students will be able to:

1) Understand mobile cellular architecture.
2) Understand the multiple access schemes & IEEE802.11
3) Analyze the technology channel interference in path propagation.
4) Understand the technology switching and traffic system.
5) Analyze the GSM System.
6) Understand the technology HEPERLAN & Android system.

UNIT-I	**Introduction to Mobile Communication**	**(Hours)**
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	**Multiple Access Schemes**	**(Hours)**
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	**Propagation Path Loss and Propagation Models**	**(Hours)**
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	**Switching and traffic**	**(Hours)**
	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and	08

	mobility management.	
UNIT-V	**Practical Cellular Mobile system-GSM**	**(Hours)**
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers.**CDMA:** Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	**Wireless Local Area Networks**	**(Hours)**
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. **Introduction to Android** Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08

Text Books:	
1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
2)	Jochen Schiller, "Mobile Communication" Pearson Education Ÿ
3)	V. K. Garg, J. E. Wilkes, "Principle and Application of GSM", Pearson Education
Reference Books:	
1)	V. K. Garg, "IS-95 CDMA &CDMA 2000", Pearson Education
2)	W. Frank Ableson,Robi sen, Chris King, " Android IN ACTION ", Third Edition, Dreamtech Press
3)	Mobile Computing By Rajkamal (Oxford).
Syllabus for Unit Test:	
Unit Test - 1	**Unit I ,II and III**
Unit Test - 2	**Unit IV, V and VI**

M.Tech (IT) Semester - I Subject: MOBILE NETWORKS AND COMMUNICATION		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Total Credits : 04**
Course Objectives:		
To gain an understanding of the principles behind the design of wireless communication systems and technologies.		
Course Prerequisites:		
Students should have knowledge of		
Computer Networking & communication system		
Course Outcome:		
Students will be able to:		
1) Understand mobile cellular architecture.		
2) Understand the multiple access schemes & IEEE802.11		
3) Analyze the technology channel interference in path propagation.		
4) Understand the technology switching and traffic system.		
5) Analyze the GSM System.		
6) Understand the technology HEPERLAN & Android system.		
UNIT-I	**Introduction to Mobile Communication**	**(Hours)**
	Cellular mobile architecture overview and cellular system design , Frequency management and channel assignment, Frequency reuse channels, concepts of cell splitting, handover in cellular system, handoff algorithms and dropped calls.	08
UNIT-II	**Multiple Access Schemes**	**(Hours)**
	SDMA, FDMA, TDMA, CDMA, comparison of S/T/F/CDMA based on terminals signal separation and advantages and disadvantages; IEEE 802.11 & 802.16 wireless standards, System architecture.	08
UNIT-III	**Propagation Path Loss and Propagation Models**	**(Hours)**
	Co-channel & Non-co-channel interference: Exploring co-channel interference areas in system, reduction of co channel interference, Different types of non-co channel interferences, different ways to reduce interference and in turn improve cell coverage.	08
UNIT-IV	**Switching and traffic**	**(Hours)**

	General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and mobility management.	08
UNIT-V	**Practical Cellular Mobile system-GSM**	**(Hours)**
	Cellphone generations 1G, 2G, 3G, Standards for wireless communication system UMTS etc; GSM architecture and interfaces, GSM subsystems, mapping of GSM layers on to OSI layers.**CDMA:** Major attributes IS-95 system architecture, air interface, physical and logical channel and call processing.	08
UNIT-VI	**Wireless Local Area Networks**	**(Hours)**
	Introduction, Types of WLANs, Hidden station problem, HIPERLAN Type 1: HIPERLAN/1 MAC sublayer, HIPERLAN/1 CAC layer, HIPERLAN/1 physical layer. IEEE 802.11 WLAN standards: IEEE 802.11 physical layer, IEEE 802.11 MAC sublayer. IEEE 802.11 and HIPERLAN standards for 5 GHz band: HIPERLAN/2 physical layer, HIPERLAN /2 data link control layer. Bluetooth: Introduction, User Scenario, Architecture, protocol. **Introduction to Android** Layers, android components, mapping application to process. Android development basics. Hardware tools, Software tools, Android SDK features	08

Text Books:	
1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
2)	Jochen Schiller, "Mobile Communication" Pearson Education Ÿ
3)	V. K. Garg, J. E. Wilkes, "Principle and Application of GSM", Pearson Education
Reference Books:	
1)	V. K. Garg, "IS-95 CDMA &CDMA 2000", Pearson Education
2)	W. Frank Ableson,Robi sen, Chris King, " Android IN ACTION ", Third Edition, Dreamtech Press
3)	Mobile Computing By Rajkamal (Oxford).

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester II											Total Duration : 20 Hrs/Week Total Marks : 500 Total Credits : 18
Subjects	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme (Marks)**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/ assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/ PR/ OR**	
Research Foundation	04	--	60	20	10	10	--	--	04	--	04
Information Retrieval	04	02	60	20	10	10	25	25	04	01	05
Real Time Systems	04	--	60	20	10	10	--	--	04	--	04
Information Security	04	02	60	20	10	10	25	25	04	01	05
Total	**16**	**04**	**240**	**80**	**40**	**40**	**50**	**50**	**16**	**02**	**18**

M.Tech IT Semester II	Subject: Research Foundation	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
	Continuous assessment : 40 Marks	**Total Credits : 04**

Course Objectives:

1) Assist students in planning and carrying out research projects, further research oriented studies or jobs

2) The students are exposed to the principles, procedures and techniques of implementing a research finding.

3) Students involve with finding out the literature using information technology / computer technology and with using the tools for data analysis in various sectors, and writing the reviews, papers, reports and thesis.

Course Prerequisites:

Students should have knowledge of

1) Problem definition

2) Project Preparation and publications

3) Mathematical and Statistical Analysis

Course Outcome:

Students will be able to:

1) Define and describe the research, research process and research methods.

2) Understand and apply research methods including design, data analysis, and interpretation.

3) Project Report, and Research Paper writing

UNIT-I	**Research Idea**	**(Hours)**
	Introduction to research. Research: objectives, motivation, types, approaches, methods and methodology. Research and scientific method.	08
UNIT-II	**Research Processes**	**(Hours)**
	How research is done, research processes, research criteria, research problem definition, problem selection, need of defining the problem, techniques involved in defining a problem.	08
UNIT-III	**Research Design**	**(Hours)**
	Research design: idea, why research designs, characteristics of design, types of designs, experimental design.	08
UNIT-IV	**Novelty**	**(Hours)**
	Novelty and Originality in Research: Resources, skills, time management, role of supervisor and research scholar, interaction with subject experts.	06
UNIT-V	**Paper, Thesis and Report Writing**	**(Hours)**
	Thesis Writing: Title, Abstract, Introduction, Literature review / previous works, Methodology, Result / Data analysis, Comparisons	08

	with earlier works, Conclusion, Future Scopes and References (IEEE / Springer / ACM / Elsevier formats). Importance of literature review, source of literature: books, journals, proceedings, thesis and dissertations, unpublished documents. On-line Searching: Database, SciFinder, Scopus, Science Direct, Searching research articles, Citation Index, Impact Factor, H-index.	
UNIT-VI	**Tools**	**(Hours)**
	Analytical tools, Introduction to data analysis, linear data and non-linear data, exponential type data, logarithmic type data, power function data and polynomials of different orders. Plotting and fitting of linear, Non-linear, Gaussian, Polynomial, and Sigmoidal type data. Quantitative Techniques: Steps of quantitative analysis, reliability of the data, errors classification, accuracy, precision, statistical errors. LaTeX: Writing scientific report, research report, revision, writing project proposal, paper writing for international journals, conference presentation, Slides preparation, pictures, graphs and citation styles.	10

Assignment List:	
1)	Briefly describe the different steps involved in a research process. What do you mean by research? Explain its significance in modern times.
2)	Write short notes on: Design of the research project; Ex post facto research; Motivation in research; Objectives of research; Criteria of good research; Research and scientific method.
3)	Describe the different types of research, clearly pointing out the difference between an experiment and a survey.
4)	What is the necessity of defining a research problem? Explain.
5)	Explain the meaning of the following in context of Research design: (a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.
6)	Distinguish between an experiment and survey. Explain fully the survey method of research.
7)	Write short notes on the following: (a) Cross tabulation; (b) Discriminant analysis; (c) Coefficient of contingency; (d) Multicollinearity; (e) Partial association between two attributes.
8)	5. Distinguish between the following:

	(a) Statistic and parameter; (b) Confidence level and significance level; (c) Random sampling and non-random sampling; (d) Sampling of attributes and sampling of variables; (e) Point estimate and interval estimation. 7. 8. In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.
9)	(a) 500 articles were selected at random out of a batch containing 10000 articles and 30 were found defective. How many defective articles would you reasonably expect to find in the whole batch? (b) In a sample of 400 people, 172 were males. Estimate the population proportion at 95% confidence level.
10	"We can teach methods of analysis, yet any extensive research... requires something equally important: an organisation or synthesis which provides the essential structure into which the pieces of analysis fit." Examine this statement and show how a good research report may be prepared.
Text Books:	
1)	C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
2)	P. Oliver, Writing Your Thesis, New Delhi: Vistaar Publications, 2004.
Reference Books:	
1)	R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
2)	F. Mittelbach and M. Goossens,The LATEX Companion, 2nd. ed. Addison Wesley, 2004.
3)	J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3nd. ed. Sage Publications, 2008.
4)	Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
5)	B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis,2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
6)	Gregory, Ethics in Research, Continuum, 2005.
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II	Subject : Information Retrieval	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination 60 Marks**	**Theory :04**
Practical :02	**Continuous assessment 40 Marks**	**Practical : 01**
	Term Work:25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) To provide students with an overview of the main principles and methods underlying the domain of Information Retrieval.

2) To address more recent developments in IR such as collaborative filtering and Latent Semantic Indexing.

Course Prerequisites:

Students should have knowledge of

1) Basic basic information retrieval techniques.

2) Data Structures and Algorithm Analysis

Course Outcome:

Students will be able to:

1) Understand the impact on web of information retrieval.

2)) Understand basic information retrieval models.

3) understand experimental evaluation of information retrieval

4) understand information retrieval implementation in search engines

5) understand language-model based retrieval

6) understand Information Extraction and Integration

UNIT-I	**Introduction**	**(Hours)**
	Goals and history of IR. **IR Basics**: inverted index, query and document representations, boolean retrieval, simple tf/idf and other ranking schemes. The impact of the web on IR. Information behavior, browsing vs seeking, types of search	08
UNIT-II	**Basic IR Models**	**(Hours)**
	Boolean and vector-space retrieval models; ranked retrieval; text-similarity metrics; TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. **Basic Tokenizing, Indexing, and Implementation of Vector-Space Retrieval**: Simple tokenizing, stop-word removal, and stemming; inverted indices; efficient processing with sparse vectors; Java implementation.	08

UNIT-III	Experimental Evaluation of IR	(Hours)
	Performance metrics: recall, precision, and F-measure; Evaluations on benchmark text collections. **Query Operations and Languages**: Relevance feedback; Query expansion; Query languages. **Text Representation**: Word statistics; Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. Metadata and markup languages (SGML, HTML, XML).	08
UNIT-IV	**Web Search**	**(Hours)**
	Search engines; spidering; metacrawlers; directed spidering; link analysis (e.g. hubs and authorities, Google PageRank); shopping agents. **Text Categorization**: Categorization algorithms: Rocchio, nearest neighbor, and naive Bayes. Applications to information filtering and organization.	08
UNIT-V	**Language-Model Based Retrieval**	**(Hours)**
	Using naive Bayes text classification for ad hoc retrieval. Improved smoothing for document retrieval. **Text Clustering**: Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM). Applications to web search and information organization.	08
UNIT-VI	**Recommender Systems**	**(Hours)**
	Collaborative filtering and content-based recommendation of documents and products. **Information Extraction and Integration**: Extracting data from text; semantic web; collecting and integrating specialized information on the web.	08

Assignment List:	
1)	Study impact of Information retrieval on web
2)	Write a program to implement TF-IDF to rank data
3)	Write a program to normalize the data
4)	Write a program to analyze indexer
5)	Write a program to analyze recall and F-measure top 3 popular search engines.
6)	Analyze working of open source crawlers.
7)	Implement naïve bayes algorithm to retrieve the data
8)	Write a program to implement k-means algorithm.
9)	Write a program to design dynamic forms for collaborative filtering

10)	Write a program to to collect feedback using various recommendation techniques
Text Books:	
1)	Introduction to Information Retrieval, by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2008
Reference Books:	
1)	Search Engines: Information Retrieval in Practice by W. Bruce Croft, Donald Metzler, and Trevor Strohman
2)	Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schutze, Cambridge University Press. 2008
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II	**Subject : Real Time Systems**	
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	
		Total Credits : 04

Course Objectives:		
1) The aim of the course is to introduce the student to the theory of formal verification methods and techniques used for real time systems.		
2) This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in Real Time System.		
Course Prerequisites:		
Students should have knowledge of		
1)Basic understanding of C.		
2) Basic understanding of Computer Architectures.		
3) Basic understanding of Operating Systems		
Course Outcome: Real time system is one of class of f complex systems whose performance must be analyzed at the earlier phases of development. The methods and techniques in this course are widely used now a day in industries for these verifications of Real Time System. The students would have then a strong background of modeling, simulation and verification..		
Students will be able to:		
1) Clearly differentiate the different issues that arise in soft and hard real-time systems. Explain the various concepts of time that arise in real-time systems.		
2) Understand basic multi -task scheduling algorithms and approaches for scheduling.		
3) Understand basic for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling.		
4)Able to understand the desired language characteristics of real time programming languages.		
5) Clearly differentiate the Real Time Vs Gerenal – Purpose Databases.		
6)Understand the real time communication.protocols.		
UNIT-I	**Introduction**	**(08 Hours)**
	Real time Applications,Hard Versus Soft Real Time Systems, A reference model of Real Time Systems ,Issues in Real-Time Computing, Structure of real time systems, Task Classes, characterizing Real -Time Systems: Performance Measures for Real Time Systems., Estimating Program Run Times	
UNIT-II	**Real Time Scheduling**	**(08 Hours)**
	Approaches to Real Time Scheduling : Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach **Scheduling** : Introduction, Classical Uniprocessor Scheduling - Rate Monotonic scheduling Algorithm,Preemptive Earliest Deadline First(EDF) Algorithm **Uniprocessor scheduling of IRIS tasks-**Identical Linear Reward Functions,Nonidentical Reward Functions,0/1 Reward Functions,Identical	

	Concave Reward Function, Non identical Concave Reward Function,	
UNIT-III	**Task Assignment**	**(08 Hours)**
	Utilization Balancing Algorithm,A Next – Fit Algorithm for RM Scheduling,A Bin – Packing Assignment Algorithm for EDF,A Myopic Offline Scheduling (MOS) Algorithm,The Buddy Startegy,Assignment and Precedence Conditions.	
UNIT-IV	**Programming Languages and Tools**	**(08 Hours)**
	Introduction,Desired language characteristics,Data Typing,Control Structures,Facilitating Hierarchical Decomposition,Packages,Run Time Error Handling,Multitasking,Task Scheduling,Timing specifications,Experimental Languages:Flex,Euclid **Run Time Support:**Compiler,Linker,Debuuger,Kernel	
UNIT-V	**Real Time Databases**	**(08 Hours)**
	Introduction,Real Time Vs Gerenal – Purpose Databases,Main memory databases,Transaction Priorities,Transaction Aborts,Concurrency Control Issues,Disk Scheduling Algorithm,A Two-Phase Approach to improve predictability,Mainaining serilalisation Consistency,Databases for Hard real Time systems.	
UNIT-VI	**Real Time Communication**	**(08 Hours)**
	Introduction,Model Of Real Time Communication,Priority based Service Disciplines for switched network,Weighted Round Robin service disciplies,Medium Access control protocols of Broadcast networks,Real Time Protocols,Communication in multicomputer systems	

Text Books:

1)	C.M.Krishna,Kang G.Shin “Real Time Systems”,Tata McGraw Hill Edition
2)	Jane W.S.Liu,”Real Time Systems” Pearson Educatio

Reference Books:

1)	Real-Time Systems: Theory and Practice Kindle Edition by Rajib Mall

Syllabus for Unit Test:

Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester II Subject :Information Security		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 Hrs/week	**End Semester Examination : 60 Marks**	**Theory: 04**
Practical :02 Hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks	**Total Credits:05**
	Prat/Oral : 25 Marks	
Course Objectives:		
• Discuss various administrative, technical, governance, regularity and policy aspects of Information Security Management.		

• Provide hands on approaches will be discussed to better understand and to devise strategies related to security policy.		
Course Prerequisites:		
Students should have knowledge of		
1 Fundamentals of Telecommunication and computer networks.		
Course Outcome:		
Students will be able to:		
1) Understand mathematical formulation in security algorithms.		
2) Understand aspect of information security management including planning, process, policy, procedure and security model as well as hardware and software technologies to safeguard organizational assets.		
3) develop skills of security management progression within an organization.		
4) Perform email and graphic image recovery as well as investigations.		
5) Implement cryptography algorithms.		
6) Learn business continuity planning concepts.		
UNIT-I	**MATHEMATICAL FOUNDATIONS OF INFORMATION SECURITY :**	**(6 Hours)**
	Topics in elementary number theory: O and Ω notations ,Euclidean algorithm ,Congruence's, Euler's phi function , Fermat's Little Theorem , Chinese Remainder Theorem , Applications to factoring ,finite fields , quadratic residues and reciprocity: Quadratic residues ,Legendre symbol , Jacobi symbol. Simple Cryptosystems: Enciphering Matrices, Encryption Schemes, Symmetric and, Asymmetric Cryptosystems, Cryptanalysis, Block ciphers, Use of Block Ciphers, Multiple Encryption, Stream Ciphers, Affine cipher, Vigenere, Hill, and Permutation Cipher, Secure Cryptosystem.	
UNIT-II	**SECURITY ELEMENTS:**	**(6 Hours)**
	Authorization and Authentication - types, policies and techniques - Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Polices and Procedures, Firewalls, IDS, Log Files, Honey Pots .Access control, Trusted Computing and multilevel security - Security models, Trusted Systems, Software security issues, Physical and infrastructure security, Human factors – Security awareness, training , Email and Internet use policies, Third Party Development - Intellectual Property Issues .	
UNIT-III	**INFORMATION SECURITY POLICIES: INDUSTRIES PERSPECTIVE:**	**(6 Hours)**
	Introduction to Information Security Policies, About Policies, why Policies are Important ,When policies should be developed , How Policy should be developed - Policy needs – Identify what and from	

	whom it is being protected , Data security consideration, Backups, Archival storage and disposal of data - Intellectual Property rights and Policies – Incident Response and Forensics - Management Responsibilities – Role of Information Security Department.	
UNIT-IV	**SECURITY THREATS :**	**(6 Hours)**
	Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber crime Security Threat Management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools -Threat identification - Threat Analysis - Threat Modeling - Model for Information Security Planning**.**	
UNIT-V	**PUBLIC KEY CRYPTOSYSTEMS:**	**(6 Hours)**
	The idea of public key cryptography, RSA Cryptosystem , Bit security of RSA , ElGamal Encryption , Discrete Logarithm , Knapsack problem , Zero-Knowledge Protocols . Primality and Factoring: Pseudo primes , the rho (γ) method , Format factorization and factor bases ,the continued fraction method , the quadratic seieve method. Number Theory and Algebraic Geometry: Elliptic curves, basic facts , elliptic curve cryptosystems , elliptic curve primality test ,elliptic curve factorization.	
UNIT-VI	**AUDITING AND BUSINESS CONTINUITY PLANNING**	**(6 Hours)**
	: Introduction to information security audit and principles of audit. Business continuity planning and disaster recovery. Case study: 9/11 tragedy. Backup and recovery techniques for applications and storage. Computer forensics: techniques and tools. Forensic tools VMware,Security testing tool BackTrack, Audit Tools: NESSUS and NMAP. Information Security Standards and Compliance: Overview of ISO 17799 Standard. Legal and Ethical issues.	

Assignment List:

1.	Assume a web-based system that has a state-less front-end web server (which just processes requests as it is with no state being tracked), an application engine (such as a Java servlet engine) that receives requests forwarded by the front-end, and a database that is used store/retrieve/manage data by the application engine. The application engine hosts application for a bank. The web-based system allows for a user to carry out online transactions, online viewing of accounts as well as other common tasks. (a) What types of logging mechanisms should be used for the front-end, the application engine, and for the database in order to audit the requests received, their processing, and the privilege modes/user ids in which requests are processed. (b) What auditing should such a system support?

2.	Pretend you've just seen a new type of malware that places the malicious code in an audio file, by using different frequencies to correspond to different instructions. Existing vulnerabilities are used to get access to the system and install a small interpreter that reads the infected audio files and executes them. Assume that you are unable to detect/prevent the interpreter (and that it doesn't do anything harmful by itself anyway) - your job is to detect or prevent it from executing malicious audio files. (a) List one or more ways you could *detect* an infected audio file. Provide a brief (one paragraph) description of each approach.
3.	Write a program to perform substitution ciphers to encrypt the explain text to Caesar cipher and to decrypt it back to plain text.
4.	Write a program to generate Symmetric Keys for the following Cipher algorithms DES, AES, Blowfish, TripleDES.
5.	Write a program to encrypt input string by using SecretKey of the following algorithms, and then decrypt the encrypted string and compare the decrypted string with the input string. Use the following algorithms for encryption and decryption: a.RSA b.AES c.DSA
6.	Write a program to perform transposition ciphers to encrypt the plain text to cipher and to decrypt it back to plain text using Simple Columnar technique.
7.	Assignment based on the presentation on either of following topics: ISO 17799 Standard NESSUS and NMAP Audit Tools ElGamal Encryption Asymmetric Cryptosystems
8.	Case study on secure configuration of Email Server.

Text Books:

1)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2nd Edition, Springer, 2002.
2)	Johannes A. Buchman, "Introduction to Cryptography", 2nd Edition, Springer, 2004.
3)	Serge Vaudenay, "Classical Introduction to Cryptography – Applications for Communication Security", Springer, 2006.
4)	Victor Shoup, "A Computational Introduction to Number Theory and Algebra", Cambridge University Press, 2005.
5)	William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
6)	Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.

Reference Books:

1)	.Nina Godbole, Information Systems Security-Security Management, Metrics, Frameworks and Best Practices, Wiley, 2009
2)	Information Security Policies, Procedures, and Standards:Guidelines for Effective

	Information Security Management (Paperback) Auerbach,1st edition, 2001
3)	Neal Koblitz, "A Course in Number Theory and Cryptography", 2nd Edition, Springer, 2002.
4)	Swiderski, Frank and Syndex, "Threat Modeling", Microsoft Press, 2004.

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech - Information Technology

Semester III									Total Duration : 28 Hrs/Week Total Marks : 475 Total Credits : 40		
Subject	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/ PR/ OR**	
Elective –I	04	02	60	20	10	10	25	25	04	01	05
Elective –II	04	02	60	20	10	10	25	25	04	01	05
Self-Study Paper-I	04	--	60	20	10	10	-	-	04	-	04
Dissertation Stage –I	-	07	-	-	---	--	25	--		21	21
Seminar	-	05	-	-	--	--	25	25	-	05	05
Total	**12**	**16**	**180**	**60**	**30**	**30**	**100**	**75**	**12**	**28**	**40**

Elective – I	**Elective - II**
• Natural Language Processing & Understanding • Computer Forensics & Cyber Laws • Advanced MIS • Wireless Networks • Data Warehousing & E-Commerce	• Bio-informatics • Advanced Computer Architecture • Usability Engineering • Advanced Database Management • Advanced Operating System

M.Tech IT Semester III ELECTIVE I: Natural Language Processing And Understanding		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work :25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1. To understand natural language processing and to learn how to apply basic algorithms in this field.
2. To conceive basics of knowledge representation, inference, and relations to the artificial intelligence.
3. To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics, as well as the resources of natural language

Course Prerequisites:

Students should have knowledge of working of compiler phases

Course Outcome:

Students will be able to:

1. Evaluate language technology components.
2. Understand various parsing methodologies.
3. Understand various language models and relate them in probability perspective.
4. Map and solve the language parsing problem with dynamic programming.
5. Understand machine learning techniques and can assess which ones are suitable for a given problem.

UNIT-I	Introduction and Overview:	**(08 Hours)**
	Introduction, Overview and Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic analysis and Representation Structures, Natural Language Generation, Natural Language Systems, What is Natural Language Processing ?,Ambiguity and Uncertainty in language.	
UNIT-II	**Parsing and CFG:**	**(08 Hours)**
	String Edit Distance and Alignment: Key algorithmic tool: dynamic programming, First a simple example, its use in optimal alignment of sequences. String edit operations, edit distance, examples of use in spelling correction, machine translation. **Context Free Grammars:** Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing; Bottom-Up Parsing, and the Problems with each. Non-probabilistic model. **Parsing:** Efficient CFG parsing with CYK, another dynamic programming algorithm. Designing a little grammar and parsing with it on some test data.	

UNIT-III	**Information Theory :**	**(08 Hours)**
	What is information? Measuring it in bits. Entropy, cross-entropy, information gain. Its application to some language phenomena. **Language modeling and Naive Bayes:** Probabilistic Language modeling and its applications. Markov models. Estimating the Probability of a Word, and Smoothing. Generative models of language and their Application.	
UNIT-IV	**Hidden Markov Models :**	**(08 Hours)**
	Part of Speech Tagging and Hidden Markov Models : The concept of Parts-of-speech, Examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. **Viterbi Algorithm for Finding Most Likely HMM Path :** Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese Word Segmentation, Prosody, information extraction, Weighted Context Free Grammars. Weighted CYK. Pruning and Beam Search.	
UNIT-V	**Classifiers and Models:**	**(08 Hours)**
	Maximum Entropy: The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks. **Maximum Entropy Markov Models & Conditional Random Fields:** Part-of-speech tagging, Noun-phrase segmentation and information extraction models that combine maximum entropy and finite-state machines. State-of-the-art models for NLP.	
UNIT-VI	**Machine Translation:**	**(08 Hours)**
	Probabilistic models for Translating any Language into English. Alignment, translation, Language generation.	

Text Books:

1.	Jurafsky, Dan and Martin, James, Speech and Language Processing, Prentice Hall.

Reference Books:

1.	Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
2.	Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
3.	Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

4.	Radford, Andrew et. al., Linguistics, an Introduction, Cambridge University Press, 1999.
	Assignment list :
1.	Implement part of a noisy-channel model for spelling correction.
2.	Write regular expressions that extract phone numbers and regular expressions that extract email addresses.
3.	Using Naïve Bayes algorithm classify selected movie review as positive or negative
4.	Build a maximum entropy Markov model (MEMM) for identifying person names in newswire text.
5.	Implement two translation models, IBM model 1 and IBM model 2, and apply these models to predict English word alignments.
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective - I Advanced MIS		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 Hrs	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks	
	Prat/Oral : 25 Marks	**Total Credits : 05**

Course Objectives:

1) Explain the changing organizational environment and the use of information technology to manage contemporary organizations

2) Identify the business impacts of business and social networking

3) Explain the technological foundations of information systems, i.e., hardware, software and telecommunications

Course Prerequisites:

Students should have knowledge of

1) Information System Management

2) System Analysis and design

3) Management information system

Course Outcome:

Students will be able to:

1) Explain the organizational context of information systems, including decision making and information processing concepts

2) Identify, conceptualize, and develop solutions to prepare conceptual design report

3) Based on conceptual system design the student should able to prepare detailed system design alongwith technological foundations of information systems, i.e., hardware, software,informationprocessing.

4).To understand implementation evaluation of system and pitfalls in MIS.

5).Identify applications of MIS in manufacturing sector.

6)Understand design of business systems using contemporary tools.

UNIT-I	**Introduction:**	**(08 Hours)**
	Foundation of Information System : Introduction to Information System and MIS, Decision support and decision making systems, systems approach, the systems view of business, MIS organization within company, Management information and the systems approach. **Information Technology:** A manager's overview, managerial overviews, computer hardware & software, DBMS, RDBMS and Telecommunication.	
UNIT-II	**Conceptual System Design:**	**(08 Hours)**
	Define the problems, set systems objective, establish system constraints, determine information needs, determine information sources, develop alternative conceptual design and select one document ,the system concept, prepare	

	the conceptual design report.	
UNIT-III	**Detailed System Design :**	**(08 Hours)**
	Inform and involve the organization, aim of detailed design, project management of MIS detailed design , identify dominant and trade of criteria, define the sub systems, sketch the detailed operating sub systems and information flow, determine the degree of automation of each operation, inform and involve the organization again, inputs outputs and processing, early system testing, software, hardware and tools propose and organization to operate the system, document the detailed design, revisit the manager user.	
UNIT-IV	**Implementation Evaluation and Maintenance of the MIS :**	**(08 Hours)**
	Plan the implementation, acquire floor space and plan space layouts, organize for implementation, develop procedures for implementation, train the operating personnel, computer related acquisitions, develop forms for data collection and information dissemination, develop the files , test the system, cut-over, document the system, evaluate the MIS control and maintain the system. Pitfalls in MIS development.	
UNIT-V	**Advanced Concepts in Information Systems :**	**(08 Hours)**
	Enterprise Resources Management(ERP), Supply Chain Management, CRM, Procurement Management System. Applications of MIS in Manufacturing sector, Service sector	
UNIT-VI	**Designing of business systems :**	**(08 Hours)**
	Design of business systems using contemporary tools and methods such as SQL, CASE tools, OOD tools, etc. Advanced Case Studies in MIS.	

Text Books/Referemnce Books:

1)	Kenneth C. Laudon , "Management Information Systems", Eighth Edition, PHIŸ
2)	James O'Brien and George Marakas, "Management Information Systems
3)	Effy Oz, "Management Information Systems", Course TechEffy

Assignment List :

1)	**Introduction to MIS**
2)	**Generating conceptual system design report**
3)	Case study on detailed system design based on **conceptual system**
4)	**Implementation ,evaluation and maintainance of MIS.**

5)	Analysis of pitfalls in MIS developement
6)	**Case study of advanced concepts in information system.**
7)	To study applications of MIS in service sector.
8)	**Design of business system using contepoarary tools and methods such as SQL.**
9)	**Study of CASE tools and OOD tools.**
10	**Case study of lsoftware used for building information system.**

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective-I WIRELESS COMMUNICATION NETWORK		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week **Practical : 02 hrs/week**	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Practical :01**
	Term Work :25 Marks	**Total Credits : 05**
	Prat/Oral : 25 Marks	

Course Objectives:

To gain an understanding of the principles behind the design of wireless communication systems and technologies.

Course Prerequisites:

Students should have knowledge of

…Computer Networking And Communication

Course Outcome:

Students will be able to:

1) Understand mobile cellular architecture.
2) Understand the multiple access schemes & Handover, Handoff system.
3) Analyze the technology digital celluare system.
4) Understand the technology WLAN ,Bluetooth.
5) Understand the GPRS System.
6) Understand the technology ADHOC & 802.16 system.

…

UNIT-I	**INTRODUCTION OF WIRELESS COMMUNICATION**	**(Hours)**
	Challenges in wireless networking, Wireless communications standards Overview, evolution of cellular system, Cellular system architecture & operation, Performance criteria. Multiple access schemes for wireless communication -TDMA, FDMA, CDMA, SDMA	08
UNIT-II	**WIRELESS NETWORK PLANNING AND OPERATION**	**(Hours)**
	frequencies management, channel assignments, frequency reuse, System capacity& its improvement, Handoffs & its types, roaming, co channel & adjacent channel interference .	08
UNIT-III	**DIGITAL CELLULAR NETWORKS**	**(Hours)**
	GSM architecture& interfaces, signal processing in GSM, frame structure of GSM, Channels used in GSM, The European TDMA Digital cellular standard.	08
UNIT-IV	**WIRELESS LAN TECHNOLOGY**	**(Hours)**

	Overview, WLAN technologies, infrared LANs, Spread Spectrum LANs Narrowband Microwave LANs IEEE 802.11- Architecture, protocols, MAC layer .MAC frame, MAC management. **BLUETOOTH** Overview, Radio specification, Base band specification, Link manager specification, logical link control & adaptation protocol.	08
UNIT-V	**MOBILE DATA NETWORKS**	**(Hours)**
	Introduction, Data oriented CDPD networks, GPRS **WIRELESS ACCESS PROTOCOL** WAP architecture , Wireless Datagram ,Wireless Transport layer security, wireless transaction ,Wireless Session ,Wireless Application Environment ,WML	08
UNIT-VI	**Emerging Wireless Network Technology**	**(Hours)**
	IEEE 802.11 WLAN, ETSI HIPER LAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMANTechnology, Mobile Adhoc Network, Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology.	08

Text Books:	
1)	William C.Y.Lee, "Mobile cellular Telecommunication" ,2nd Ed. McGraw-Hill Ÿ
2)	Jochen Schiller, "Mobile Communication" Pearson Education Ÿ
3)	V. K. Garg, J. E. Wilkes, "Principle and Application of GSM", Pearson Education
Reference Books:	
1)	William Stalling," Wireless Communication & Networking"
2)	Rampantly," Mobile communication"
3)	Kamilo Feher," Wireless digital communication", PHI, 1999

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective –I DATA WAREHOUSING AND E-COMMERCE		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	**Total Credits : 5**
	Oral/Practical : 25 Marks	

Course Objectives:

1) Techniques for Developing Proper Data Warehouses

2)Analyze the E-Commerce Payment Mechanism and Risk

3) Recognize the business impact and potential of e-Commerce

Course Prerequisites:

Students should have knowledge of

1) Information Systems

Course Outcome:

Students will be able to:

1) Understand the analysis Decision Support System, Types and architecture.

2) Understand and analyze process for Development of DSS.

3) To understand Data Warehouse Concept and database.

4) To understand E-Commerce & Third Parties

5) To understand Risk and E-Commerce Payment Mechanism

6)To understand E-Commerce payment mechanism

UNIT-I		**(Hours)**
	Types of Decision Support System: The DSS hierarchy, Generalising the categories, Matching the DSS to the Decision type, Individual and group DSS. Matching the DSS to the user Community, Matching DSS to the decision Maker's Psychological type, User modes institutional Vs ad-hoc DSS. DSS Architecture, Hardware and Operating Systems Platform: Defining the DSS Arch. The major options, the internet and client-server computing in DSS, DSS using shared data on separate system, DSS on stand alone system, Open system and DSS, DSS user interface. DSS Software Tools: DSS software categories, standard packages, Specialized tools and generators, programming languages for DSS, DSS user interfaces	08
UNIT-II		**(Hours)**
	Building & Implementing Decision Support System: The DSS development process, DSS development project particulars. The implementation stage, system conversion. Overcoming resistance to change, DSS implementation issues, using the list of issues, Ethical issues in DSS.	08

UNIT-III	Data Warehousing & Executive Information System Fundamentals: Definitions uses & necessity of a data warehousing, Data warehouse concepts, Executive information systems. The Data Warehouse Database: Contents of the data warehouse database, database structures, and Getting data into data warehouse, Media.	**(Hours)**
		08
UNIT-IV	E-Commerce & The Role of Independent Third Parties: Introduction, consulting parties & accountant's independence, CPA version project, New assurance project, New assurance services undefined by the AICTE the Elliot committee 7 the Cohen Committee, three views of E-Commerce. E-commerce integrity & security assurance, internal control framework, competition, risk assessment assurance, impact of e-commerce on the traditional assurance function, continuous auditing, third party assurance of web based e-commerce, security of data, business plitics, transactions processing integrity, privacy of data, web-site seal options, better business bearu. Trustee, veri-sign, ACSA, AICPA/CICA web trust, business practices, transaction integrity, information protection, report issuance, implication for the accounting, professional skill sets, expansion of assurance services, consulting and international services	**(Hours)**
		08
UNIT-V	E-Commerce & Internet: Introduction, traditional EDI system, the origin of EDI, non-EDI systems, value added network(VANS) and pre-established trading partners, partially integrated EDI systems, benefits of EDI systems, Data transfer and standards, Department of Defense transaction,. Examples, financial EDI, EDI systems and Internets, Security concerns, security of data during transmission, audit trials and acknowledgements, authentication, interact trading relationship; consumer to business, business to business, government to citizen benefits, EDI web browser transaction, software, insights EDI and internet systems. Real time EDI inventory links with suppliers, integrated delivery links with federal express, web based sales, Impact of EDI internet applications on the accounting profession, Increased complexity of auditing through the computer, integrity of reliance in the VANs, Extension of audit to trading partners systems, increased technological skill of smaller accounting firms.	**(Hours)**
		08
UNIT-VI	Risk of Insecure Systems: Introduction, Overview of risks associated with internet transactions, internet associated risks, risks of customers, false or malicious web sites, stealing visitor's hard id, & passwords, stealing visitor's credit card and information, spying on visitor's hard drive, theft of customer data from selling	**(Hours)**

	agents and ISPs, Privacy and use of cookies, risk to selling agents, customer impersonation, denial of service attacks, data theft, internet associated risks, sabotage by former employees, snuffers, financial fraud, down loading of data, emails proofing, social engineering, risks associated with business transaction data transferred between trading partners, intranet extranet and internet relationship, data interception, message origin authentication, proof of delivery, message integrity & unauthorized viewing of messages, timely delivery of messages, risk associated with viruses and malicious code overflows, viruses, Trojan Horses, hoaxes, buffer overflows, implication for the accounting profession, intranet internet controls web site assurance. E-Commerce Payment Mechanism: Introduction, the SET protocol. SET v/s SSI, version 1.0, payment gateway, Certificate Insurance, Certificate trust chain, Cryptography methods, Dual signature, the set logo, Compliance testing, Status of software implementation, version 2.0, and intermediate releases, magnetic strip cards, smart cards, Electronic cheques, The FSTC's electrons cheques, the FSTC's BIPS specification, audit implications, Electronic bill presentation & payment system.	
		08

Assignment List:	
1)	What is Decision Support System? Explain Types of Decision Support System.
2)	Case Study: DSS Software Tools
3)	Explain Building & Implementing Decision Support System
4)	Case Study: Trustee, veri-sign, ACSA, AICPA/CICA web trust
5)	Explain EDI, non-EDI systems, value added network (VANS) with example.
6)	What are the types of digital wallets? Explain
7)	Relationship-Based Smart Credit Cards
Text Books and References::	
1)	Efrem G. Mallach, “Decision support & data warehouse system”, MGH International
2)	Green Stein, FeinMan , “Electronic Commerce”, MGH International
3)	W.S.Jawadekar, “Management Information System”, MGH International
4)	Daniel Minoli, “Web Commerce technology handbook”, MGH International
5)	Mathews Leon, “The E-biz Primer- Alexis Leon”, MGH International
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective I: Computer Forensics and Cyber Laws		
Teaching Scheme	Examination Scheme	Credit Allotted
Theory : 04 hrs/week	End Semester Examination : 60 Marks	Theory : 04
Practical : 02 hrs/week	Continuous assessment : 40 Marks	Term Work : 01
	Term Work : 25 Marks	Total Credits: 05
	Pract/Oral : 25 Marks	

Course Objectives:		
1) Computer Forensics is a rapidly changing field. Simple things, like stronger encryption introduced into operating systems, create new challenges for forensic examiners every day.		
Course Prerequisites:		
Students should have knowledge of		
1) Practical experience of Computer Network and Network Security		
Course Outcome:		
Students will be able to:		
1) Know the role of computer as forensic investigator		
2) Know techniques for recovering data, tools used for recovery		
3) setting up remote logging in Windows		
4) Apply data recovery mechanism with the help of tools.		
5) Analyze the security audit with the help of logs		
6) Apply copyreight protection standard to the innovative network		
UNIT-I	Overview:	(08 Hours)
	Concept of Computer Forensic, Types of Forensic Science, Storage device, Storage device characteristics, types of storage device. Forensic Investigator: Role of Computer Forensic Investigator, line of investigation, investigation steps, responsibilities of Computer Forensic Investigator.	
UNIT-II	Evidence:	(08 Hours)
	Definition of evidence, life cycle of evidence, types of evidence, rules for evidence, evidence. Storage and its Security Incident Response: Introduction, Investigations, Pre-Incident Preparations, Formation of Incident Response Team, Role of Incident Response Team. Data Recovery: Definition of data recovery, data recovery mechanism, techniques for recovering data, tools used for recovery.	
UNIT-III	Investigating Logs:	(08 Hours)
	Audit logs and security, system log, remote logging, configuring Windows, logging, setting up remote logging in Windows, event	

	reporter and Application Logs.	
UNIT-IV	Forensic Tools:	(08 Hours)
	WinHex, X-Ways, Index.dat Analyzer, Data Doctor. Disaster Recovery: Preparing for disaster recovery, backing up data, scheduling backup jobs, restoring data, recovering from server failure, selecting disaster recovery methods.	
UNIT-V	Battling Cyber Squatters and Copyright Protection in the Cyber World :	(08 Hours)
	Concept of domain name and reply to cyber squatters, meta-tagging, legislative and other innovative moves against cyber squatting, freedom and control on the internet, works in which copyright subsists and meaning of copyright, copyright ownership and assignment, license of copyright, copyright term and respect for foreign works, copyright infringement, offences and remedies, copyright protection and content on the internet, copyright notice, disclaimer and acknowledgment, downloading for viewing contents, hyper-linking and framing, liability of ISPs for copyright, violation in the cyber world, legal developments in the US, Napster and its cousins, computer software piracy	
UNIT-VI	Digital Signature, Certifying Authorities and E-Governance :	(08 Hours)
	Digital signature, digital signature certificate, certifying authorities and liabilities, digital signature Governance in India.	

Assignment List:	
1)	Analyze various types of storage structures
2)	Understand line of investigation in the form of steps
3)	Analyze life cycle of evidence for security
4)	Apply data recovery mechanism with the help of tools.
5)	Analyze the security audit with the help of logs
6)	Analyze WinHex in detail
7)	Apply disaster recovery techniques to preserve data
8)	Apply copyreight protection standard to the innovative network.

Text Books/References:	
1)	Jay A. Siegel, “Forensic Science: The Basics “
2)	Joe Nickell and John F. Fischer, “Crime Science: Methods of Forensic Detection”
3)	Anthony J. Bertino, “Forensic Science: Fundamentals and Investigations”
4)	Stuart H. James and Ph. D., Jon J. Nordby, “Forensic Science: An Introduction to Scientific and Investigative Techniques”, 2nd edition
5)	Colin Evans, “The Casebook of Forensic Detection: How Science Solved 100 of the

	World's Most Baffling Crimes”
6)	Edward Amoroso, “Cyber Security, Computer Network Security and Cyber Ethics”, 2nd edition by Joseph Migga Kizza
7)	Robert McCrie, “Security Operations Management”, Second Edition Andy Jones and Debi Ashenden, “Risk Management for Computer Security:
8)	Andy Jones and Debi Ashenden, “Risk Management for Computer Security

Syllabus for Unit Test:	
Unit Test -1	Unit I ,II and III
Unit Test -2	Unit IV, V and VI

M.Tech IT Semester III Subject: Elective II: BIOINFORMATICS		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory :04**
Practical : 02	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	
	Oral/Practical : 25 Marks	**Total Credits : 05**

Course Objectives:

1. Receive an introduction and historical perspective to the field of bioinformatics
2. Learn the key methods and tools used in bioinformatics
3. Understand the theoretical basis behind bioinformatics
4. Analyze protein sequences, identify proteins, and retrieve protein structures from databases. View and interpret these structures.

…

Course Prerequisites:

Students should have knowledge of

1) Advanced Molecular Biology (or equivalent)

…

Course Outcome:

Students will be able to:

1) Understand the Basic concepts of Bioinformatics
2) Understand and analyze Sequence Alignment and Database Searching
3) To understand Protein Structure
4) To understand Protein-protein Interactions and Algorithms.
5)To understand Protein function and Computer tools for phylogenetic analysis

UNIT-I	Bioinformatics Basics: Basic concepts, Protein and amino acid , DNA & RNA, Sequence, structure and function. Bioinformatics databases: Introduction, Motivation, Type of databases, Nucleotide sequence databases, Protein sequence databases, Sequence motif databases, Protein structure databases, Other relevant databases.	**(**08 **Hours)**
UNIT-II	Sequence Alignment and Database Searching: Single sequence alignments, Biological motivation, Pairwise alignments, Scoring matrix, Gap penalty, Dynamics programming, Needleman- Wunsch, Smith-Waterman, Heuristic methods, FASTA, BLAST, Statistics of sequence alignment score, E-Value, P-Value, Multiple sequence alignments, ClustalW, Profile, Profile-sequence	**(**08 **Hours)**

	alignment, Profile-profile alignment, PSI-BLAST, Hidden Markov Models. Protein structure alignments : Structure superposition, structure alignment, Different structure alignment algorithms.	
UNIT-III	Protein Structure: Protein secondary structure predictions: Protein secondary structure, Hydrogen bond, secondary structure element, Methods for predicting secondary structure. Protein tertiary structure modeling: Basic concepts Protein folding and dynamic simulation, Comparative modeling, Threading, Ab initio modeling, Combined modeling approaches, CASP: A blind protein structure prediction competition. Experimental methods for protein structure determination: X-ray crystallography, Nuclear magnetic resonance (NMR).	**(**08 **Hours)**
UNIT-IV	Protein-protein Interactions: Experimental identification of protein-protein interactions, Yeast two- hybrid assay, High-throughput mass spectrometry, Interaction networks and system biology. Protein quaternary structure modeling: Basic concepts, Degrees of freedom, Presentation of protein conformations, Hydrophobicity factor, Shape complementary, Docking Scoring function, Protein-protein docking algorithms, Protein-ligand docking algorithms, Drug design, Multiple-threading algorithms, Homology modeling of protein-protein interactions, Protein and ligand binding, CAPRI.	**(**08 **Hours)**
UNIT-V	Biomolecular Simulations: Basic concepts, Units and derivatives , Force field and energy landscape, Truncation of nonbonded interactions. Conformational Sampling: Introduction, Minimization and algorithms, Molecular dynamics, Ensembles (statistical mechanics), Monte Carlo simulations.	**(**08 **Hours)**

	Solvation: Introduction, Periodic boundary condition, Ewald summation, Implicit solvent model and continuum electro statics, Monte Carlo simulation on parallel computers. Advanced Techniques: Introduction, Replica-exchange simulations, Restraint potentials, Free energy calculations, Membrane simulations.	
UNIT-VI	Biological Membranes: Introductions, Biological roles, Structural features, Membrane lipids, General structures, Aggregation states, Polymorphism, Thermal transitions, Electrostatic effects, Molecular dynamics, Membrane proteins, MD simulation of Membrane proteins. Protein function: Sequence to function, Structure to function, Protein function identification methods and databases. Phylogenetics, Sequence-based taxonomy, Models, assumptions, and interpretations, From multiple alignment to phylogeny, Computer tools for phylogenetic analysis.	**(**08 **Hours)**

Assignment List:	
1)	Explain Bioinformatics Basics.
2)	Explain concept of Sequence Alignment and Database Searching.
3)	Explain Protein Structure and Protein quaternary structure modeling
4)	Explain Bio-molecular Simulations.
5)	Explain Conformational Sampling.
6)	Explain in detail Biological Membranes.
7)	Explain Protein function with examples.

Text Books and References::	
1)	David Mount, "Bioinformatics", Cold Spring Harbor Press"
2)	James Jisdall, "Beginning Perl for Bioinformatics"
3)	David W. Mount, "Bioinformatics- Sequence & Genome Analysis"

Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective – II Advanced Computing Architecture		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week **Practical : 02 hrs/week**	**End Semester Examination : 60 Marks**	**Theory :04**
	Continuous assessment : 40 Marks	**Practical : 01**
	Term Work : 25 Marks	**Total Credits : 05**
	Practical / Oral : 25 Marks	

The aim of the course is to design distributed computing architecture to improve the efficiency of system.

Course Objectives:

1) Analyze the structure of distributed computing

2) Apply the efficient solution with respect to suitable distributed computing Architecture.

Course Prerequisites:

Students should have knowledge of

2) Basic knowledge of distributed system

Course Outcome:

Students will be able to:

1) Understand distributed environment.

2) Analyze performance of distributed Architectures

3) Analyze the computing parameters.

4)Understand data and computing measures

5) Analyze bottlenecks during the enhancement

6) Apply the suitable architecture to enhance the performance.

UNIT-I	**Introduction to cloud computing**	**(Hours)**
	Introduction to to various distributed computing architectures – Grid, cluster, cloud. Structure of cloud, computing parameters of cloud, boost in the performance due to cloud.	06
UNIT-II	**Architecture of cloud computing**	**(Hours)**
	Service Models – Infrastructure As a Service (IaaS) , Platform as a Service (PaaS), Software as a Service (SaaS) Deployment Models – Public cloud, private cloud, Hybrid cloud, community cloud	06
UNIT-III	**Big Data**	**(Hours)**
	Concept of Big Data, Challenges to deal with Big Data , solution with respect to big data, data Analytics.	06
UNIT-IV	**Data Intensive Computing**	**(Hours)**
	Introduction to hybrid data, concept of Hadoop Distributed	06

	File Structure (HDFS), data node, name node, job tracker, Task Tracker.	
UNIT-V	**Architecture of Map Reduce Algorithm**	**(Hours)**
	Concept of unstructured data, Introduction to Map Reduce Algorithm, Implementation with word count example.	06
UNIT-VI	**Case Study of advanced computing Architecture**	**(Hours)**
	Cloudstack, Eucalyptus, Azure, big data analytics, Hadoop,Implementation of MapReduce -II	06

Assignment List:	
1)	**Design cluster using apache web server**
2)	**Design cloud computing environment using public cloud**
3)	**Design cloud computing environment using private cloud**
4)	**Analyse the Complete data of BVUCOE using big data analytics**
5)	**Use HDFS to deal with huge data.**
6)	**Implement Map Reduce Algorithm to prove the rise in the efficiency**
7)	**Implement Map Reduce II**
8)	**Analyze various computing environments like cloudstack , openstack.**
Text Books:	
1)	**Architecture the cloud, Michael J. Kevis, Wiley publication**
2)	**Microsoft Big Data Solution, Adam Jorgensen, Wiley publication**
3)	**Hadoop: The Definitive Guide, Tom White, O'REILLY' publication**
Reference Books:	
1)	**Building the Infrastructure for cloud security, Raghu Yelori, Enrique castro-Leon**
2)	**Hadoop Operations, Eric Sammer, O'REILLY' publication**
3)	**MapReduce Design Patterns: Building Effective Algorithms and Analytics Donald Miner, O'REILLY' publication**
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective II: Usability Engineering		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Term Work : 01**
	Term Work : 25 Marks	**Total Credits: 05**
	Pract/Oral : 25 Marks	

Course Objectives:

1) To present the basic principles and practical knowledge regarding the design, development and evaluation of human-computer interfaces in the light of usability

Course Prerequisites:

Students should have knowledge of

2) Practical experience of software system analysis and design

Course Outcome:

Students will be able to:

2) Define and distinguish between the different types of user interface

2) Develop a more usable interface

3) To identify techniques and technologies that can satisfy usability and accessibility specifications

4) To apply usability methods in developing interactive systems

5) To identify and analyze the various components of the overall context of use of an interactive system

6) To develop usability and accessibility specifications that can be used in evaluating and developing interactive systems-

UNIT-I	**Introduction**	**(08 Hours)**
	Introduction, Importance, Human computer interface, Characteristics of GUI, Direct manipulation graphical system, Web user interface, Mobile UI, Popularity of graphics **Generations of User Interfaces:** Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces	
UNIT-II	**Development Processes**	**(08 Hours)**
	Managing Design Processes: Organizational Design to Support Usability, The three Pillars of Design, Development Methodologies, Ethnographic Observation, Participatory Design, Scenario Development, Social Impact Statement for Early Design Review, Legal issues **Evaluating Interface Designs:** Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance Tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments	

UNIT-III	**User Interface Software and Specifications**	**(08 Hours)**
	Languages and tools for specifying and building interfaces, Dialogue independence, UIMS (user interface management system) approach, Languages and software abstractions for user, interfaces, Programming support tools	
UNIT-IV	**Develop System Menus and Navigation Schemes**	**(08 Hours)**
	Menus: Structures, Functions, Content, Formatting of Menus, Phrasing the Menu, Selecting Menu Choices, Navigating Menus, Kinds of Graphical Menus **Windows:** Window Characteristics, selection of window, Components of a Window, Window Presentation Styles, Types of Windows, Window Management, Organizing Window Functions, Window Operations, Web Systems	
UNIT-V	**Interaction Styles, Devices and Techniques**	**(08 Hours)**
	Interaction Styles: Question and answer, Form-based, Command language Menus, Natural language, direct manipulation **Interaction Devices**: Keyboard and function keys, pointing device, speech recognition digitization and generation, image and video displays, drivers **New Interaction Techniques:** New modes of human-computer communication, Voice, Gesture, Eye movement, Tangible, user interfaces, Brain-computer interfaces	
UNIT-VI	**UI Feedback, Guidance and Assistance**	**(08 Hours)**
	Providing the Proper Feedback: Response Time, Dealing with Time Delays, Blinking for Attention, Use of Sound **UI Guidance and Assistance:** Preventing Errors, Problem Management, Providing Guidance and Assistance, Instructions or Prompting, Help Facility	

Assignment List:	
1)	Introduction to fundamentals of Usability Engineering
2)	Study on User Interface Software and Specifications
3)	Design a sport watch interface
4)	Design a web application interface for online grocery shopping
5)	Design a touch screen interface for an Automatic Teller Machine (ATM) geared towards kids aged 10-15 whose parents have opened a savings account for them
6)	Design an interface and list user experience for a universal remote to be used in home settings

Text Books:	
1)	Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, *Designing the User Interface:*

	Strategies for Effective Human-Computer Interaction, Addison-Wesley, Reading, Mass. (any recent edition)
2)	Y. Rogers, H. Sharp, and J. Preece, *Interaction Design: Beyond Human-Computer Interaction*, John Wiley & Sons. (any recent edition)
Reference Books:	
1)	Don Norman, *The Design of Everyday Things*
2)	Jakob Nielsen, *Usability Engineering*
3)	Jakob Nielsen and Raluca Budiu, *Mobile Usability*
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: **Elective II: Advanced Database Management System**		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical : 02 hrs/week	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work : 25 Marks **Prat/oral : 25 Marks**	**Total : 05**

Course Objectives:		
1) Introduce principles and foundations of distributed databases and parallel databases		
2) Understand the operations in Transaction management		
Course Prerequisites:		
Students should have knowledge of		
1)Basic database management system concepts and their operations.		
Course Outcome:		
Students will be able to:		
1) Understand distributed database architecture and design		
2) Understand the processing and optimization of distributed queries		
3) Understand the performance issues in high performance databases		
4) Understand the working of parallel database management system		
5) Understand the transaction management process		
6) Understand latest advancement in database management systems		
UNIT-I	**Distributed databases: Architecture and Design**	**(Hours)**
	Distributed data processing,What is a DDBS; Advantages and disadvantages of DDBS, Problem areas Distributed DBMS Architecture: Transparencies in a distributed DBMS,Distributed DBMS architecture, Global directory issues, Distributed Database Design: Alternative design methodologies and strategies, Distributed design issues, Types and role of Fragmentation, Types and role of replication, Data allocation	08
UNIT-II	**Distributed query processing and optimization**	**(Hours)**
	Distributed Query processing: Problem of query processing, Distributed query, Query decomposition, Distributed Query Processing Methodology, translation global queries to fragment	08

	queries Distributed Optimization: Objectives of query optimization, Factors governing query optimization, Ordering of fragment queries, optimization of join operation, Load balancing, Distributed query optimization algorithms	
UNIT-III	**Issues and Concerns in High Performance Databases**	**(Hours)**
	Database Tuning and Performance: benchmarking, TPC benchmarks, object oriented benchmarks, TP Monitors, TPC and Wisconsin benchmarks, performance measurement, and performance tuning. Semantic data Control : View management, Data security, Semantic Integrity Control Indexing structures: Btrees, hash files, multi-attribute indexing.	08
UNIT-IV	**Parallel Database Management System**	**(Hours)**
	Introduction: Types of parallelism in database systems, Parallel Query Processing, multiprocessor architectures, parallel relational operators, parallelism in main-memory DBMS, parallel handling of integrity constraints, Integrated I/O parallelism Parallel Query Processing and Optimization: Inter-query parallelism, intra-query parallelism, intra-operation parallelism, inter-operation parallelism, objectives of parallel query optimization, parallel query optimization, load balancing, parallelism in join queries, testing the quality of query optimization	08
UNIT-V	**Advanced concepts in Transaction Management**	**(Hours)**
	Transaction Management: ACID properties, pessimistic locking, optimistic locking, flat transactions, nested transactions, deadlock detection and management and their algorithms, Recovery Methods Concurrency control and Reliability in Distributed Dtabases: Concurrency control in centralized database systems vs Concurrency control in DDBSs, Distributed concurrency control algorithms, Deadlock management, Reliability issues in DDBSs; Types of failures, Reliability techniques, Commit protocols, Recovery protocols	08
UNIT-VI	**Emerging trends in databases**	**(Hours)**
	Mobile Databases, Distributed Object Management, Multi-databases, Semantic databases, Hadoop Distributed File Systems, MapReduce Overview, NoSQL Databases, Design and Comparison of NoSQL Databases, Active and Deductive databases	08

Assignment List:	
1)	**To study and implement different types of Views in SQL**
2)	**Study and implementation of all types of Joins using SQL**
3)	**Implementation of hash files**
4)	**Study of transaction and implementing transaction operations using SQL/PL-SQL**
5)	**Installation and study of Hadoop.**
6)	**Installation and study of any NoSQL database**
7)	**Comparison and Implementation of locking techniques**
8)	**Case study of the operations of any real time distributed DBMS and parallel DBMS**
Text Books:	
1)	Stefano *Ceri and* Giuseppe *Pelagatti,* "Distributed databases principles and systems", Tata Hill
2)	Raghu Ramkrishnan, "Database Management System", McGraw-Hill
3)	Silberschatz, Korth and Sudharshan, "Data base System Concepts", Mc-GrawHill
Reference Books:	
1)	M. Tamer Özsu and Patrick Valduriez, "Principles of Distributed Database Systems", Springer Science & Business Media, 2011, 3rd edition
2)	Elmasri and Navathe, "Fundamentals of Database Systems", Addison-Wesley, 2007
3)	Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management ",Pearson Education, LPE
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

M.Tech IT Semester III Subject: Elective-II- Advanced Operating Systems		
Teaching Scheme	**Examination Scheme**	**Credit Allotted**
Theory : 04 hrs/week	**End Semester Examination : 60 Marks**	**Theory : 04**
Practical :02	**Continuous assessment : 40 Marks**	**Practical : 01**
	Term Work :25 Marks	
	Prat/Oral :25 Marks	**Total Credits : 05**

Course Objectives:

1) To provide students with an overview of operating systems with change in technologies and use

Course Prerequisites:

Students should have knowledge of

1) Basic concepts of operating systems.

2) Basic algorithms in operating systems.

Course Outcome:

Students will be able to:

1)Understand core structure of operating systems

2)) Understand distributed operating systems.

3) Understand distributed resource management.

4) Understand multiprocessor and database operating systems.

5) Understand real time and mobile operating systems.

UNIT-I	INTRODUCTION	**(Hours)**
	Overview – Functions of an Operating System – Design Approaches – Types of Advanced Operating System – Synchronization Mechanisms – Concept of a Process, Concurrent Processes – The Critical Section Problem, Other Synchronization Problems – Language Mechanisms for Synchronization – Axiomatic Verification of Parallel Programs – Process Deadlocks – Preliminaries – Models of Deadlocks, Resources, System State – Necessary and Sufficient conditions for a deadlock – Systems with Single-Unit Requests, Consumable Resources, Reusable Resources.	08
UNIT-II	DISTRIBUTED OPERATING SYSTEMS	**(Hours)**
	Introduction – Issues – Communication Primitives – Inherent Limitations - Lamport's Logical Clock; Vector Clock; Casual Ordering Global State; Cuts; Termination Detection. Distributed Mutual Exclusion – Non Token Based Algorithms – Lamport's Algorithm – Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm – Distributed Deadlock Detection – Issues – Centralized Deadlock Detection Algorithms – Distributed Deadlock-Detection Algorithms, Agreement Protocols – Classification – Solutions – Applications.	08

UNIT-III	DISTRIBUTED RESOURCE MANAGEMENT	**(Hours)**
	Distributed File Systems – Architecture – Mechanisms – Design Issues – Distributed Shared Memory – Architecture – Algorithm – Protocols – Design Issues, Distributed Scheduling – Issues – Components - Algorithms	08
UNIT-IV	FAULT RECOVERY AND FAULT TOLERANCE	**(Hours)**
	Basic Concepts – Classification of Failures- Basic Approaches to Recovery; Recovery in Concurrent Systems; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues – Two phase and Non-blocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.	08
UNIT-V	MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS	**(Hours)**
	Structures – Design Issues – Threads –Processing Synchronization – Process Scheduling – Memory Management – Reliability / Fault Tolerance; Database Operating Systems –Introduction – Concurrency Control – Distributed Database Systems – Concurrency Control Algorithms.	08
UNIT-VI	REAL TIME AND MOBILE OPERATING SYSTEMS	**(Hours)**
	Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management – File system.	08

Assignment List:
1)Study of hardware and software requirements of different operating systems
2) Implement CPU scheduling policies.
3)Implement Lamport's Algorithm – Token-Based Algorithm
4) Implement Suzuki-Kasami's Broadcast Algorithm
5) Study of distributed file systems – architecture
6)Study of fault recovery and fault tolerance
7) Implement file storage allocation techniques.
8) Study of Concurrency Control Algorithms.

9) Case study of mobile operating systems	
10) Case study of real time operating systems	
Text Books:	
1)	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
2)	Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
Reference Books:	
1)	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2)	Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
3)	Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.
Syllabus for Unit Test:	
Unit Test -1	**Unit I ,II and III**
Unit Test -2	**Unit IV, V and VI**

Proposed Structure of M.Tech Information Technology
CBCS Pattern (2015-16)

STRUCTURE & EXAMINATION PATTERN

MTech Information Tecnology

Semester IV									Total Duration : 14 Hrs/Week Total Marks : 325 Total Credits : 34		
Subject	**Teaching Scheme (Hrs) Hrs./Week**		**Examination Scheme**						**Examination Scheme (Credits)**		**Total Credits**
	L	**P**	**Theory**	**Unit Test**	**Attendance**	**Tutorial/ assignments**	**TW**	**Pract/ Oral**	**TH**	**TW/PR/OR**	
Self-Study Paper-II	04	--	60	20	10	10	-	-	**04**	**-**	**04**
Dissertation Stage –II	-	10	-	-	--	-	150	75		30	30
Total	**04**	**10**	**60**	**20**	**10**	**10**	**150**	**75**	**04**	**30**	**34**

List Of Self Study Subjects

Sr. No.	Self Study Paper I Sem-III	Self Study Paper II Sem-IV
1	Real Time & Fault Tolerant System	Information Storage and Management
2	Ad-hoc Network	Organizational Behavior
3	Computer Oriented Numerical & Statistical Methods	Computer Vision and Digital Image Processing
4	Semantic Networks	Artificial Intelligence & Applications
5	Embedded System and Applications	Design and Analysis of Algorithms
6	Distributed Computing	Compiler Design
7	Information Theory Coding and Cryptography	Computer Oriented Optimization Techniques
8	Soft Computing	Information Security System

M. Tech. – 2023 Course

Rules and Regulations

(I) Theory

(A) Theory Examination

Theory examination consists of: (i) End semester examination (ESE), and (ii) Internal assessment (IA).

(i) ESE is of 50 marks for theory courses.

(ii) IA is of 50 marks. Following tools shall be used for evaluation of IA.

a) Project based learning
b) Quiz
c) Case study
d) Presentation (seminar)
e) Industrial visit and report submission
f) Open book test
g) Industry relevant problem
h) MCQ
i) System design
j) Modelling
k) Unit test

Note : 1. Each unit shall be evaluated with appropriate tool/s mentioned above.

2. Course coordinator shall prepare unit wise plan for conduction of IA with specifying tool and submit it to PG coordinator in the beginning of the term.

3. Course coordinator shall maintain documentation of IA and shall submit it to PG coordinator after completion of each unit.

4. Appropriate blooms taxonomy level shall be maintain while conduction and evaluation of IA.

5. Course coordinator shall submit the IA marksheet of 50 marks to examination section at the end of the semester.

(B) Standard of Passing

(i) There is a separate passing of 50% of 50 marks, i.e. 25 marks, for ESE for a given course.

(ii) There is a separate passing of 50% of 50 marks, i.e. 25, for IA for a given course.

(iii) A candidate who fails at ESE in a given course has to reappear only at ESE as a backlog candidate and clear the head of passing. Similarly, a candidate who fails at IA in a given course has to reappear only at IA as a backlog candidate and clear the head of passing

(II) Practical

(A) Practical Examination

Practical examination consists of: (i) Term work, and (ii) Practical/Oral examination for a given course.

(i) Term work (TW): TW marks are as mentioned in the curriculum structure.

(ii) Practical/Oral (PR/OR): PR/OR marks are as mentioned in the curriculum structure.

(B) Conduction of practical/oral examination

(i) A candidate will be permitted to appear for practical/oral examination only if he/she submits term work of a given course.

(ii) Practical/oral examination shall be conducted in the presence of internal and external examiners appointed by university.

(C) Standard of Passing

(i) A candidate shall pass both heads TW and PR/OR separately with minimum 50% of total marks of respective head.

(III) MOOC, Social Activity Course, and Research Paper Publication

(i) If a candidate successfully completes a MOOC in a given semester relevant to the courses in that semester, he/ she will earn additional TWO credits in a given semester subject to submission of the certificate of completion of the respective course. Maximum credits earned by particular student/s will be 4 during the programme.

Following MOOC courses after appearing an examination will be considered for allotment of credits:

1. SWAYAM : www.swayam.gov.in
2. NPTEL: www.onlinecourse.nptel.ac.in
3. COURS ERA : www.coursera.org
4. edX online learning : www.edx.org
5. UDEMY : www.udemy.com

6. MIT Open Course ware : www.ocw.mit.edu
7. CDAC AI & AR-VR : https://futureskillsprime.in/course/basic-certificate-course-in-artificial-intelligence

MOOC (Max. Credits : 04)

Sr. No	Type of the Activity	No. of Activities	Credits Allotted	Credits Earned
1	Certification in MOOC course		2	
Total Credit earned =				

(ii) If a candidate successfully completes extracurricular activity, he/she will earn additional TWO credits in a given semester subject to submission of the certificate of completion of the respective course/ activity from the relevant authorities. Maximum credits earned by particular student/s will be 4 during the programme.

A) Extra-Curricular Activities (Max. Credits : 04)

Sr. No	Type of the Activity	No. of Activities	Credits Allotted	Credits Earned
1	Participation in Project Exhibition / Contest held at state / national / international level		0.5	
2	Winning award at the project contest as mentioned in (1)		1	
3	Participation in sports / cultural event / contest held at state / national / international level		1	
4	Wining award at the contest as mentioned in (3):		2	
5	Participation in any social activity for the betterment of poor / needy people		0.5	
Total Credit earned =				

(iii) For submission of thesis based on dissertation work carried out by candidate in sem III and IV, he / she has to publish two papers based on his/ her dissertation work carried out in sem III and IV one in international conference and one in UGC approved CARE journals/Journals cited in standard databases such as SCOPUS, Web of Science, any other referred journals etc. After publication of papers mentioned above, he/she will earn additional credits in a given semester subject to submission of the documents of publication of the respective paper.

B) Research Publications (Max. Credits : 06)

Sr. No	Type of the Publication	No. of Publications	Credits Allotted	Credits Earned
1	International Journal		2	
2	National Journal		1	
3	International Conference		1	
4	National Conference		0.5	
Total Credit earned =				

(iv) The additional credits for MOOC, Extracurricular Activity and Research Paper Publication will be given only after the authentic document is verified by the Head of the Department and a separate mark-sheet will be submitted by the Head of the Department along with the course examiner

(IV) Carry forward of the term

(i) A candidate who is granted term for M. Tech. Semester-I, III, will be carry forward to M. Tech. Semester-II, IV examination, respectively even if he/she appears and fails or does not appear at M. Tech. Semester-I,III, examination respectively.

(ii) A candidate shall be carry forward the M. Tech. Semester-III course if he/she has a backlog of any number of Heads of passing at M. Tech. Semester-I & II taken together.

(V) Certifications

(i) A student shall receive PG DEGREE after completion of two years PG programme of 80 credits.

(VI) Grade Point, Grade Letter and Equivalent Marks

The candidate must obtain a minimum Grade Point as per the University rules and regulations defined in CBCS 2014.

(VII) Span for completion of programme :

The candidate must clear all the examination heads within two years from the date of registration of programme. If he / she fails to complete the programme in stipulated time span then extension of 1+1 year will be provided to the candidate on his/her request for which he/ she has to apply for the same to the university office through proper channel.