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

## STRUCTURE & EXAMINATION PATTERN

**MTech Information Technology**

| Semester I | | | | | | | | | | | Total Duration : 20 Hrs/Week<br>Total Marks : 500<br>Total Credits : 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

| Subjects | Teaching Scheme (Hrs)<br>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:**

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| | 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 |
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| | 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 |
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| | General description, Special features for handling traffic, Small switching systems, systems enhancement, resource allocation and mobility management. | 08 |
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| **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)** |
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| **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 |
| | |
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| **Syllabus for Unit Test:** | |
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| **Unit Test -2** | **Unit IV, V and VI** |

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# 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; <br> (b) Confidence level and significance level; <br> (c) Random sampling and non-random sampling; <br> (d) Sampling of attributes and sampling of variables; <br> (e) Point estimate and interval estimation. <br><br> 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? <br> (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.<br><br>**Query Operations and Languages**:<br><br>Relevance feedback; Query expansion; Query languages.<br><br>**Text Representation**:<br><br>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.<br><br>**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.<br><br>**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.<br><br>**Information Extraction and Integration**:<br><br>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<br>**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 $\Omega$ 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 ($\gamma$) 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?

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|---|---|
| **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.<br>(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:<br>a.RSA<br>b.AES<br>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:<br>ISO 17799 Standard<br>NESSUS and NMAP Audit Tools<br>ElGamal Encryption<br>Asymmetric Cryptosystems |
| **8.** | Case study on secure configuration of Email Server. |
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| **Text Books:** | |
| **1)** | Neal Koblitz, "A Course in Number Theory and Cryptography", 2$^{nd}$ Edition, Springer, 2002. |
| **2)** | Johannes A. Buchman, "Introduction to Cryptography", 2$^{nd}$ 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. |
| | |

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|---|---|
| **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<br>Total Marks : 475<br>Total Credits : 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subject** | **Teaching Scheme (Hrs)**<br>**Hrs./Week** | | **Examination Scheme** | | | | | | **Examination Scheme (Credits)** | | **Total Credits** |
| | **L** | **P** | **The ory** | **Unit Test** | **Attenda nce** | **Tutori al/assi gnmen ts** | **TW** | **Pract/ Oral** | **T H** | **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<br>• Computer Forensics & Cyber Laws<br>• Advanced MIS<br>• Wireless Networks<br>• Data Warehousing & E-Commerce | • Bio-informatics<br>• Advanced Computer Architecture<br>• Usability Engineering<br>• Advanced Database Management<br>• 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 :**<br>    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.<br>**Information Technology:**<br>    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** <br> **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:<br>         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.<br><br>DSS Architecture, Hardware and Operating Systems Platform:<br>         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.<br>DSS Software Tools:<br>         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:<br>         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:<br>        Definitions uses & necessity of a data warehousing, Data warehouse concepts, Executive information systems.<br>The Data Warehouse Database:<br>        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:<br>        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:<br>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:<br>        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.<br><br>E-Commerce Payment Mechanism:<br><br>     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.<br>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: <br><br>        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: <br><br>        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.<br>Protein structure alignments :<br>      Structure superposition, structure alignment, Different structure<br>      alignment algorithms. | |
| | | |
| **UNIT-III** | Protein Structure:<br>Protein secondary structure predictions: Protein secondary structure, Hydrogen bond, secondary structure element, Methods for predicting secondary structure.<br>Protein tertiary structure modeling:<br>      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:<br>      X-ray crystallography, Nuclear magnetic resonance (NMR). | **(08 Hours)** |
| | | |
| **UNIT-IV** | Protein-protein Interactions:<br>      Experimental identification of protein-protein interactions, Yeast two- hybrid assay, High-throughput mass spectrometry, Interaction networks and system biology.<br><br>Protein quaternary structure modeling:<br>      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:<br>      Basic concepts, Units and derivatives , Force field and energy landscape, Truncation of nonbonded interactions.<br><br>Conformational Sampling:<br>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:<br><br>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.<br><br>Protein function:<br><br>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<br><br>**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<br>**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<br>**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<br><br>**Interaction Devices**: Keyboard and function keys, pointing device, speech recognition digitization and generation, image and video displays, drivers<br><br>**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** <br> **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 <br><br> Distributed DBMS Architecture: Transparencies in a distributed DBMS,Distributed DBMS architecture, Global directory issues, <br><br> 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.<br><br>Semantic data Control : View management, Data security, Semantic Integrity Control<br>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<br><br>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<br><br>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 |