M.Phil. (Computer Science) Syllabus (2021-22)

Department of Computer Application
North Orissa University

Srirama Chandra Vihar, Takatpur, Baripada, Odisha

http://nou.nic.in

Name of the Programme: M.Phi. in Computer Science

(a) Programme's Mission & Objectives:

Mission

The M.Phil. Programme is envisaged to contribute to the growth and development of the Computer Applications sector of the country. The course will create opportunities to share and disseminate computer science researches and innovations by bringing about debates and discussions of topical importance to address critical computer applications issues. M.Phil. is entirely based on research activities which are done in a specific direction to achieve great results. The degree stands between a master degree and Ph.D. degree and is associated to advanced research activities. First of all, the M.Phil. degree bestows us with advanced skills and knowledge and allows you to progress your learning into the area of arts or science.

Objectives

1. Appreciate that research would help to enhance efficiency, effectiveness, quality and excellence in the system of teacher computer applications.
2. Develop an understanding about problems of computer applications and methodology to explore alternative solutions.
3. Develop a rational conceptualization of the computer applications research.

M.Phil. Syllabus
(2018-19)
Dept. of Computer Application, North Orissa University, Odisha

Semester-1

Theory		Credit	Full Marks
Code			
CS-601	Research Methodology	5	50
CS-603	Mathematical Foundations to Computer Science	5	50
CS-605	Practical based on Research Tools (MATLAB/Maple/Mathematica/Octave/NS)	10	100
	TOTAL	**20**	**200**

Semester-2

Theory		Credit	Full Marks
Code			
CS-602	Advanced technologies in Computer Science	5	50
Elective		5	50
CS-604-A	Data Warehousing and Mining.		
CS-604-B	Natural Language Processing.		
CS-604-C	Knowledge Management and Business Intelligence		
CS-604-D	Mobile Computing		
CS-604-E	Advanced Algorithms		
CS-604-F	Bioinformatics		
CS-604-G	Performance Evaluation		
CS-606	Dissertation	10	100
	TOTAL	**20**	**200**

CS-601 Research Methodology

Course Objectives:
The objective of this course is to:

1. Concept of the different methods and techniques of research
2. Familiarity in the use of data organization and representation skills
3. Understanding trends of research in Computer Science

Course Content:

Unit 1
Introduction to Research Methodology : Meaning of Research, Objectives of Research, Motivations in Research, Types of Research, Research Approaches, Significance of Research, Research Methods v/s Methodology, Research and Scientific Methods, Research Process, Criteria of Good Research, Ethics in Computer Science research, Environment friendly research.

Unit 2
Sample Design: Implication, Steps. Criteria for selecting a sample procedure, Characteristics of Good sampling Procedure, Types of Sample Design, Selecting Random Samples, Complex random sampling Design.

Unit 3
Methods of Data Collection: Collection of Primary Data, Observation Method, Interview method, Collection of Data through questionnaire and Schedules, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study Method.

Unit 4
Processing and Analysis of Data: Measures of Central Tendency, Dispersion, correlation and Regression, Chi- square test : Applications, Steps, characteristics, limitations, Analysis of Variance and Co-variance.

Unit 5
Testing of Hypothesis: Meaning, Basic concepts, Flow diagram, Power of a hypothesis test, Important parametric tests, Hypothesis Testing of Means, hypothesis testing of Correlation coefficients, Limitations of Tests of hypothesis.

Course Outcomes:
After successful completion of the course, student shall be able to:

1. Undertake better research and conceivably become successful career researchers
2. Apply critical thinking and analytical mind for addressing an issue in the domain and accepting the challenge of filling the gap in the domain.
3. Make students employable in R & D sector

Reference:
1. Kothari, C.R., Research Methodology (Methods and Techniques), New Age Publisher
2. Research Methods by Francis C. Dane, Brooks/ Cole Publishing Company, California.
3. The Nature of Research : Inquiry in Academic Context by Angela Brew, Routledge Falmer (2001).
4. Research Methods by Ram Ahuja, Rawat Publications (2001).

CS-603 Mathematical Foundations to Computer Science

Course Objectives:

The objective of this course is to:

1. Learn the core mathematical concepts used in Computer Science
2. Introduce the traditional elementary discrete structures to represent and process the data to more abstract structures provided by abstract algebra and graph theory.

Course Content:

Unit 1

Matrices: Types of Matrices - Matrix Operations - Inverse of a Matrix - Properties of Determinants - Eigen Values - Cayley-Hamilton Theorem. Principle of Mathematical Induction.

Unit 2

Introduction to Probability: Sample Space and Events - Axioms of Probability - Conditional Probability – Independence of Events - Bayes Theorem. Regression and Correlation: Introduction – Linear Regression – Method of Least Squares

Unit 3

Various types of graphs- Simple and multi graphs, directed and undirected graphs, Eulerian and Hamiltonian graphs, Graph connectivity, graph traversals, Trees, spanning trees.

Unit 4

Introduction To Finite Automata: Alphabets and languages- Deterministic Finite Automata – Non-deterministic Finite Automata – Equivalence of Deterministic and Non-Finite Automata – Languages Accepted by Finite Automata – Finite Automata and Regular Expressions

Unit 5

Context Free Languages: Context –Free Grammar – Regular Languages and Context-Free Grammar – Pushdown Automata – Pushdown Automata and Context-Free Grammar – Properties of Context-Free Languages – pushdown automata and Equivalence with Context Free Grammars. Turing Machines: The Definition of Turing Machine – Computing with Turing Machines.

Course Outcomes:

After successful completion of the course, student shall be able to:

1. Demonstrate their understanding of and apply methods of discrete mathematics in CS to subsequent courses in algorithm design and analysis, automata theory and computability, information systems, computer networks.
2. Use logical notation to define fundamental mathematical concepts such as sets, relations, functions and various algebraic structures, reason mathematically using such structures, and evaluate arguments that use such structures.
3. Model and analyze a computation or communication process and construct elementary proofs based on such structures
4. Make students employable in R & D, Academics and IT sector

Reference:

1. J.K.Mantri & T.K. Tripathy, "A Modern Approach to Discrete Mathematics & structure", University Science Press
2. J. P. Tremblay and R. Manohar, "Discrete mathematical structures with application to computer science, Mc Graw Hill International

3. C. L. Liu, "Elements of Discrete Mathematics", Mc Graw Hill
4. G. Birkhoff and T.C. Bartee, "Modern Applied Algebra", Mc Graw Hill
5. S K Chakraborty & B K Sarkar, "Discrete Mathematics", Oxford University Press
6. Deo, N., "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall
7. K.H. Rosen, Discrete Mathematics and Its Applications, Tat McGraw Hill, 2003
8. Ronald E. Walpole , Sharon L. Myers , Keying Ye, "Probability & Statistics for Engineers and Scientists". 8th Edition, Pearson Education.
9. T Veerarajan, "Probability, Statistics and Random Processes", 3rd Edition, McGraw Hill Education (India)
10. Kishor S. Trivedi, " Probability and Statistics with Reliability, Queuing and Computer Science Applications ", 2nd Edition, Wiley India
11. Harry R Lewis, Cristos h. Papadimitriou, "Elemets Of The Theory Of Computation",Pearson Education / PHI.
1. 12. Hopcroft. J.E, J.D.Ullman, "Introduction to Automata Theory, Languages, and Computation", Addison-Wesley
12. Kamala Krithivasan, Rama R., "Introduction to Formal Languages, Automata Theory and Computation", Pearson India
13. Michael Sipser, "Introduction to the Theory of Computation", Cengage Learning

CS-605 Practical based on Research Tools (MATLAB/Maple/Mathematica/Octave/NS)

Course Objectives:

The objective of this course is to:

1. Learn the simulation procedure using MATLAB/Maple/Mathematica tools.

Course Contents:

Perform the following experiments using MATLAB/Maple/Mathematica

1. Working with Matrices
2. Expressions
3. Relational and Logical Operations
4. Plotting Function
5. Complex and Statistical Functions
6. Input / Output of Variables
7. (Numbers and Strings)

Course Outcomes:

After successful completion of the course, student shall be able to:

1. Apply MATLAB/Maple/Mathematica tools for problem solving.
2. Simulate the real time models for performance analysis.
3. Make students employable in R & D and technology application sectors.

Reference:

1. MATLAB Programming: Mathematical Problem Solutions (De Gruyter STEM) 1st Edition

CS-602 Advanced technologies in Computer Science

Course Objectives:

The objective of this course is to:

2. Handling large amounts of data
3. Logical and concise thinking
4. Objectifying problems
5. Fundamental knowledge of the latest technology and development.

Course Content

Unit 1

Soft Computing

Searching Techniques: Breadth first search, depth first search, uniform cost search, hill climbing, A* algorithm, Minmax and game trees, refining minmax, Alpha – Beta pruning,. Theoretical foundation of ANN: Models of ANN: Single layer perception, ANN Architecture, Feedback Networks, Back Propogation Network (BPN)

Unit 2

Ubiquitous Computing

Wireless and Cellular Communication: Wireless Transmission – Medium Access Control – Telecommunication Systems (GSM) –-Mobile IP. Routing Protocols (DSDB, DSR).

Unit 3

Data Security

Data Encryption Techniques: Algorithms for block and stream ciphers, private key encryption – DES, Algorithms for public key encryption – RSA, Euclidean Algorithms, Fermat's theorem, Digital Signatures.

Unit 4

Data Mining

Association rules: Introduction – Methods to discover association rule – Apriori algorithm Partition Algorithm, Dynamic Item set algorithm . Classification: Decision Tree classification – Bayesian Classification. Clustering Techniques - Partitioning methods, Hierarchical, Agglomerative, Divisive.

Unit 5

Data Science

Recommendation Engines: Introduction, Issues with Nearest Neighbors, The Dimensionality Problem, Singular Value Decomposition (SVD), Principal Component Analysis (PCA).

Course Outcomes:

After successful completion of the course, student shall be able to:

4. Apply logical skills and mathematical concepts to analyze, design and implement computer algorithms and programs.
5. Demonstrate proficiency in a high level programming language.
6. Demonstrate proficiency in current design techniques, i.e. Object Oriented Design.
7. Make students employable in R & D, Academics and IT sector

Reference:

1. S. N. Sivanandam, S. Sumathi, S.N. Deepa, "Introduction to Neural Networks using MATLAB 6.0 ", Tata McGraw-Hill, New Delhi, 2006.
2. S. N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley-India, 2008.

3. D.E. Goldberg," Genetic algorithms, optimization and machine learning", Addison Wesley 2000.
4. Arun K Pujari , "Data Mining Techniques", University press , Edition 2001.
5. Jaiwei Han, Michelinne Kamber , "Data Mining : Concepts and Techniques"
6. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 2007.
7. T.Sushmita mitra, Tir ku Acharaya , "Data Mining Multimedia,Softcomputing & Bioinformatics", Wiley Interscience publications , 2004.
1. 8.Jochen Schiller, Mobile Communication, Pearson, 2nd Edition, 2009.
8. C.Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks", Pearson, 2005.
9. Radia Perlman, "Interconnections", Pearsons, 2000.
10. William Stallings, "High Speed Networks and Internets", Pearson, 2010.
11. W. Stallings, Cryptography and Network Security Principles and Practices (4th ed.), Prentice-Hall of India, 2006
12. C. Pfleeger and S.L. Pfleeger, Security in Computing (3rd ed.), Prentice-Hall of India, 2007
13. MY Rhee, Network Security, John Wiley and Sons, NY, 2002.

CS-604 Data Warehousing and Mining.

Course Objectives:

1. To identify the scope and essentiality of Data Warehousing and Mining.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To study spatial and web data mining.
4. To develop research interest towards advances in data mining.

Course Content:

Unit 1
Concept of Data warehousing, 3-tier architecture, multidimensional data model, OLAP, ROLAP, and MOLAP operations. Commercial Importance of Data Warehouse, Data Mart structure, Usage of Data Mart, Security in Data Mart, Data warehouse and Data Mart.

Unit 2
Basic Elements of Data Warehouse & ETL: Source System, Data Staging Area, Presentation Server, data Cleaning, Extraction of Data, Transformation of Data, Loading of Data

Unit 3
Introduction to data mining, knowledge discovery, DBMS vs. Data Mining. Concept hierarchies, Interestingness measures, Data generalization and Summarization-based characterization, Mining Association Rules, Apriori algorithm for finding frequent item-sets, Mining Multilevel Association Rules, Mining distance-based Association Rules, Correlation Analysis.

Unit 4
Classification and prediction: decision tree based classification, Bayesian classification, classification by back propagation, k-nearest neighbor classifier
Cluster analysis: categorization of clustering methods, partitioning methods, k-Means and k-Medoids, hierarchical methods, Density-based clustering (DBSCAN)

Unit 5
Web Mining, Classification of web documents, Web content mining, Web structure mining, Web usage mining, Text Mining, Text Clustering

Course Outcomes:

1. Understand Data Warehouse, Data Mining Principles
2. Design data warehouse with dimensional modeling and apply OLAP operations.
3. Identify appropriate data mining algorithms to solve real world problems
4. Can access the data from different files like Excel, Word, SQL, PDF etc.
5. Describe complex data types with respect to spatial and web mining
6. Benefit the user experiences towards research and innovation integration
7. Make students employable in R & D, Academics and IT sector

Reference:

1. Jain Pei, Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier/Morgan Kaufmann
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 1st Edition, Pearson India
3. A.K.Pujari, "Data Mining", University Press

4. Ian H. Witten, Eibe Frank, "Data Mining Practical Machine Learning Tools and Techniques", 2nd Edition, Elsevier/Morgan Kaufmann
5. Ralph Kimball , Margy Ross, "The Data Warehouse Toolkit : The Definitive Guide to Dimensional Modeling", 3rd Edition, Wiley India
6. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", 2nd Edition, Wiley India
7. S. Anahory, D. Murray, "Data Warehousing", Pearson Education

CS-606 Natural Language Processing.

Course Objectives:

To learn the fundamentals of natural language processing

1. To understand the use of CFG and PCFG in NLP
2. To understand the role of semantics of sentences and pragmatics
3. To apply the NLP techniques to IR applications

Course Content:

Unit 1

Phases of NLP, Written and Spoken Language, Generation and Understanding

Unit 2

Regular Expressions & Automata, Words and Transducers, N-grams – Viterbi, Rough sets, POS Tagging, HMM, Max. Entropy

Unit 3

Phonetics, speech synthesis, ASR – HMM, MFCC, GMM, Acoustic models, Computational Phonology – phonological and morphological learning, finite-state and stochastic models

Unit 4

Syntactic Processing, Semantic Interpretation, Context and World Knowledge
Syntactic Processing; Formal Grammars, Parsing, Types of Parsers, ambiguity resolution

Unit 5

Meaning representation, computational semantics, lexical semantics, ambiguity resolution; Knowledge representation & reasoning, discourse context and reference, discourse structure, Pragmatics

Assignments / Tutorials
Information extraction, QA & summarization, Dialog & Conversational Agents, Machine Translation

Course Outcomes:

1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast the use of different statistical approaches for different types of NLP applications.
6. Make students employable in R & D, Academics and IT sector

Reference:

1. Natural Language Understanding by James Allen, Benjamin Cummins Publishing.
2. Natural Language Processing and Information Retrieval by Tanveer Siddiqui and U.S.Tiwary, Oxford Press.
3. Natural Language Processing by Rajeev K. Sanghal.

4. Artificial Intelligence, A modern Approach by Stuart Russel and Peter Norving, Pearson Education.
5. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (second edition) D. Jurafsky and J. Martin.

CS-608 Knowledge Management and Business Intelligence

Course Objectives:

Introduce the principles of Knowledge Management to improve organizational efficiency and effectiveness, in order to promote the competitiveness of organizations;

1. Understand the process of Business Intelligence and its role in creating value for the business;
2. Using analytical applications to monitor the organizations' performance and visualization tools;
3. Understand the purpose and meet the main techniques of Data Mining and Predictive Analytics;
4. Identify key indicators of the analytical applications in a business context**.**

Course Content:

Unit 1
Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence

Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system

Unit 2
Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models, Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model

Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies,Data preparation: Data validation, Data transformation, Data reduction

Unit 3
Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, , Support vector machines.

Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models, Logistic and production models: Supply chain optimization, Optimization models for logistics planning

Unit 4
Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management.

Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems

Course Outcomes:

1. Explain the fundamentals of business intelligence.
2. Link data mining with business intelligence.
3. Apply various modeling techniques.
4. Explain the data analysis and knowledge delivery stages.
5. Apply business intelligence methods to various situations.
6. Decide on appropriate technique.
7. Make students employable in R & D, Academics and IT sector

References:

1. Prasad, R. N., & Acharya, S. (2011). Fundamentals of Business Analytics (1st ed., p 348)Wiley India.

2. Turban, E., Aronson, J. E., Liang, T.-P., & Sharda, R. (2010). Decision support and business intelligence systems (9th ed., p. 720). Prentice-Hall.

3. Hoffer, Ramesh, & Topi. (2012or current). Modern Database Management (11thed.). Upper Saddle River, NJ: Prentice Hall

CS-610 Mobile Computing

Course Objectives:

To understand the basic concepts of mobile computing.

1. To learn the basics of mobile telecommunication system .
2. To be familiar with the network layer protocols and Ad-Hoc networks.
3. To know the basis of transport and application layer protocols.
4. To gain knowledge about different mobile platforms and application development.

Course Content:

Unit 1

Introduction to Mobile Communications and Computing**:** Introduction to Mobile Computing, novel applications, limitations, and architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

Unit 2

(Wireless) Medium Access Control**:** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA. Spreading techniques.
Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

Unit 3

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/ fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP. Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Unit 4

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques. Mobile Ad hoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Unit 5

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management).

Course Outcomes:

1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK
6. Make students employable in R & D, Academics and IT sector

Reference:

1. Jochen Schiller, Mobile Communications, Pearson Education.
2. Stojmenovic and Cacute, Handbook of Wireless Networks and Mobile Computing, Wiley.
3. Reza Behravanfar, Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, Cambridge University Press.
4. Frank Adelstein, Sandeep K.S Gupta, Golden Richard III, Loren Schwiebert, Fundamentals of Mobile and Pervasive Computing, TMH.
5. Uwe Hansmann, Lothar Merk, Martin S, Nicklous, Thomas Stober, Principles of Mobile Computing, Springer.
6. Martyn Mallick, Mobile and Wireless Design Essentials, Wiley.

CS-612 Advanced Algorithms

Course Objectives:

1. The objective of soft computing is to provide precise approximation and quick solutions for complex real-life problems.
2. The objective of artificial neural networks is to perform cognitive functions as problem solving and machine learning
3. The objective of ubiquitous computing is to embed computational capability into everyday objects to make them effectively communicate and perform useful tasks so as to minimize the end user's need to interact with computers.
4. The objective is to learn planning, implementation, and monitoring the security mechanisms that ensures protection of information technology assets.
5. The goal of data mining is to find out relationship between two or more attributes of a dataset and use this to predict outcomes or actions.

Course Content

Unit1
Soft Computing and Algorithms:
Searching Techniques: Breadth first search, depth first search, uniform cost search, hill climbing, A* algorithm, Minmax and game trees, refining minmax, Alpha – Beta pruning, Genetic Algorithm (GA): Biological terminology – elements of GA: encoding, types of selection, types of crossover, mutation, reinsertion – a simple genetic algorithm.

Unit 2
Neural Network and Algorithms:
Theoretical foundation of ANN: Models of ANN: Single layer perception, ANN Architecture, Feedback Networks: Hopfield Net and BAM - Feed Forward Networks: Back Propogation Network (BPN) and Radial Basis Function Network (RBFN).

Unit 3
Ubiquitous Computing and Algorithms:
Wireless and Cellular Communication: Wireless Transmission – Medium Access Control – Telecommunication Systems – Broadcast Systems - Wireless LAN – Mobile IP. Adhoc Wireless Networks: Adhoc Wireless Networks – MAC Protocol – Routing Protocols – Multicast Routing - QOS – Wireless Sensor Networks – Energy Management.

Unit 4
Data Security and Algorithms:
Data Encryption Techniques: Algorithms for block and stream ciphers, private key encryption – DES, Algorithms for public key encryption – RSA, Euclidean Algorithms, Fermat's theorem, Message authentication and hash functions, Digital Signatures.

Unit 5
Data Mining and Algorithms:
Association rules: Introduction – Methods to discover association rule – Apriori algorithm Partition Algorithm, Dynamic Item set algorithm – FP Tree growth algorithm. Classification: Decision Tree classification – Bayesian Classification – Classification by Back Propagation. Clustering Techniques: Introduction – Clustering Paradigms – Partitioning Algorithms – K means & K Mediod algorithms – CLARA – CLARANS.

Course Outcomes:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Analyse various neural network architectures. Understand perceptron and counter propagation networks.
4. After completion of the course the students can identify the security issues in the network and resolve it.
5. Students can apply data mining methods and techniques such as association rules, data clustering and classification for emerging applications e.g., social network analysis, stream data mining.
6. Make students employable in R & D, Academics and IT sector

Reference:

1. S. N. Sivanandam, S. Sumathi, S.N. Deepa, "Introduction to Neural Networks using MATLAB 6.0 ", Tata McGraw-Hill, New Delhi, 2006.
2. S. N. Sivanandam, S.N. Deepa, "Principles of Soft Computing", Wiley-India, 2008.
3. D.E. Goldberg," Genetic algorithms, optimization and machine learning", Addison Wesley 2000.
4. Arun K Pujari , "Data Mining Techniques", University press , Edition 2001.
5. Jaiwei Han, Michelinne Kamber , "Data Mining : Concepts and Techniques"
6. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", 2007.
7. T.Sushmita mitra, Tir ku Acharaya , "Data Mining Multimedia,Softcomputing & Bioinformatics", Wiley Interscience publications , 2004.
8. 8.Jochen Schiller, Mobile Communication, Pearson, 2nd Edition, 2009.
9. C.Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks", Pearson, 2005.
10. Radia Perlman, "Interconnections", Pearsons, 2000.
11. William Stallings, "High Speed Networks and Internets", Pearson, 2010.
12. W. Stallings, Cryptography and Network Security Principles and Practices (4th ed.), Prentice-Hall of India, 2006
13. C. Pfleeger and S.L. Pfleeger, Security in Computing (3rd ed.), Prentice-Hall of India, 2007
14. MY Rhee, Network Security, John Wiley and Sons, NY, 2002.

CS-614 Bioinformatics

Course Objectives:

The objectives to learn Bioinformatics are:

1. to manage data in such a way that it allows easy access to the existing information and to submit new entries as they are produced;
2. to develop technological tools that help analyse biological data;
3. to use these tools to analyse the data and interpret the results.

Course Content:

Unit 1
Molecular Biology and Biological Chemistry: The Genetic Material, Gene structure and Information Content, Protein Structure and Function, The nature of Chemical bonds, Molecular Biology Tools, Genomic Information Content, Data Searches and Pairwise Alignments: Dot Plot, Simple Alignments, Gaps, Scoring Matrices, Needleman and Wunsch Algorithm, Global and local Alignments, Database searches, Multiple sequence Alignments,

Unit 2
Substitution Patterns: Patterns of substitutions within Genes, Estimating Substitution numbers, Variations in evolutionary rates between Genes, Molecular clocks, evolution in Organelles. Distance based methods of Phylogenetics: History of Molecular Phylogenies, Phylogenetic trees, Distance matrix methods, Maximum likelihood approaches, Multiple sequence Alignments.

Unit 3
Character Based methods of Phylogenetics: Parsimony, Inferred ancestral sequences, Strategies for Faster searches, Consensus trees, tree confidence, Comparison of Phylogenetic methods, Molecular Phylogenies.

Unit 4
Genomics and Gene Recognition: Prokaryotic genomes, Prokaryotic gene structure, GCcontent Prokaryotic genomes, Prokaryotic gene density, Eukaryotic genomes, Eukaryotic gene structure, Open reading frames, GC-content Eukaryotic genomes, Gene expression, Transposition, Repetitive elements, Eukaryotic gene density, Protein and RNA structure prediction: Amino acids, Polypeptide composition, Secondary structure, Tertiary and quaternary structure,

Unit 5
Algorithms for Modeling Protein Folding, Structure prediction, Predicting RNA secondary structures, Proteomics: from Genomes to Proteomes, Protein classification, Experimental techniques, Inhibitors and drug design, Ligand screening, X-ray crystal structures, NMR structures, Empirical methods and prediction techniques, Postranslational modification prediction. .

Course Outcomes:

1. knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics;
2. Knowledge of existing software which can be used to effectively extract information from large databases and help in developing computational models;

3. demonstrate mastery of the core concepts of Bioinformatics, including computational biology, database design and implementation, and probability and statistics.
4. Make students employable in R & D, Academics and IT sector

Reference:

1. Dan E. Krane, Michael L. Raymer, "Fundamental Concepts of Bioinformatics", First Edition, 2003, Pearson Education, Inc. New Delhi.
2. Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", 1999, Pearson Education, Inc. New Delhi.
3. Shuba Gopal, A. Haake, R. P. Jones, P. Tymann, "Bioinformatics: A Computing Perspective", First Edition, 2009, McGraw-Hill Education (India), New Delhi.
4. Yi-Ping P. Chen, "Bioinformatics Technologies", 2006, Springer India Pvt. Ltd., New Delhi.
5. Arthur Lesk, "Introduction to Bioinformatics", 2009, Oxford University Press, ISBN-13: 978-0199208043. 4. Bryan Bergeron, "Bioinformatics Computing", 2003, PHI Learning. New Delhi.
6. Zoe Lacroix, Terence Critchlow, "Bioinformatics: Managing Scientific data", 2009, Elsevier India Pvt. Ltd., New Delhi.

CS-616 Performance Evaluation

Course Objectives:

To give the Student:-

1. Identify various network flows.
2. Evaluate performance on each flows.
3. Familiarize various strategies on flows

Course Contents:

Unit 1

Review of probability and statistics: Introduction, random variables, probability distributions, densities, jointly distributed random variables, expectation.

Unit 2

Stochastic processes: Introduction, basic definitions, Poisson process, birth-death process, Markov process.

Unit 3

Queueing Theory: Queueing systems, networks of queues, Queuing network models , computational methods for queueing network solutions.

Unit 4

Parameter estimation and hypothesis testing: Models of information systems, Introduction to reliability measures. Selection of Techniques and Metrics: Selecting an evaluation technique, selecting performance metrics, commonly used performance metrics, utility classification of performance metrics, setting performance requirements.

Unit 5

Performance measures: Estimation of MTF and other reliability parameters, Software metrics and software reliability models, Workload design, Benchmarks, case studies.

Course Outcomes:

1. The student will be capable of understanding queuing discipline, models and its applications
2. Make students employable in R & D, Academics and IT sector

Reference:

1. 1.Fortier & Michel, Computer Systems Performance Evaluation and Predictions, Elsevier.
2. Jain, The Art of Computer System Performance Analysis, John Wiley.