ಮಂಗಳೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
MANGALORE UNIVERSITY

ದಿನಾಂಕ / Date : 12/7/2011

ಕ್ರಮಾಂಕ / No.: MU/ACC/CR-16/2011-12/A2

NOTIFICATION

Sub: Syllabus of Course Work for Ph.D. in Computer Science.

Ref: Academic Council resolution No. 1-26, dated: 16-6-2011.

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The Syllabus of Course Work for Ph.D. degree programme in Computer Science which approved by the Academic Council at its meeting held on 16-06-2011 is hereby notified for implementation with effect from the academic year 2011-12.
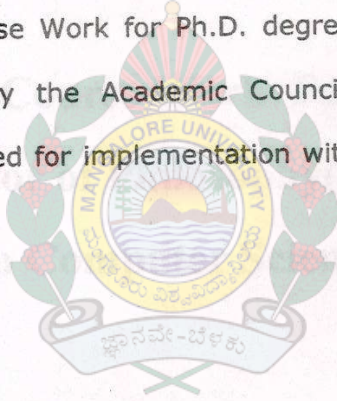
REGISTRAR

To:

(1) The Chairman of the concerned Department, Mangalore University/ Head of the Research Institution recognised by Mangalore University.
(2) The Registrar [Evaluation], Mangalore University.
(3) The Chairman, PG BOS, Computer Science, Mangalore University
(4) The Superintendent, Academic Section, O/o the Registrar, Mangalore University.

To
Dr. Doreswamy
Associate professor
Dept. of Computer Science
Mangalore University

MANGALORE UNIVERSITY

Scheme of Examination and Syllabus for

Course Work For

Doctor of Philosophy(Ph.D)

in Computer Science
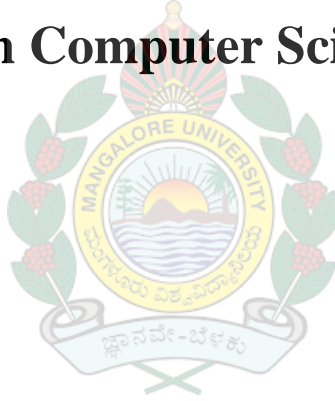
DEPARTMENT OF POST-GRADUATE STUDIES AND RESEARCH IN COMPUTER SCIENCE
MANGALAGANGOTRI-574 199
JUNE 2011

(Framed as per Clause (12) of the Regulation Governing Ph.D. degree notified on 3.9.2010 and para 3 (a) of **Guidelines For Implementation Of Regulation Governing The Degree Of Doctor Of Philosophy(Ph.D) Programme.**)

Subject Code	Subject	Theory Hours/ Week	Duration Of Exams (Hrs)	Marks & Credits			
				IA	Exam	Total	Credits
PHD-CSCW-I	*Research Methodology*	4	3	30	70	100	4
PHD-CSCW-II	Theoretical Foundations: *Advanced Data Structures and Algorithms Analysis*	4	3	30	70	100	4
PHD-CSCW-III	Recent Developments(Electives) *E1 : Data Mining And Knowledge Discovery* *E2 : Advanced Computer Networks* *E3: Cloud And Grid Computing* *E4: Pattern Recognition & Image Processing*	4	3	30	70	100	4
PHD-CSCW-IV	Reviewing of Literature and Planning of the Proposed Research work with a tentative Title *(Preparation of Research Synopsis)*	16	-	30	70	100	4
		Total					20 Credits

PHD-CSCW-I : *RESEARCH METHODOLOGY*

Theoretical Foundations
PHD-CSCW-II : *ADVANCED DATA STRUCTURES AND ALGORITHMS ANALYSIS*

Recent Developments(Electives)

PHD-CSCW-III : *E1 : DATA MINING AND KNOWLEDGE DISCOVERY*
                E2 : ADVANCED COMPUTER NETWORKS
                E3: CLOUD AND GRID COMPUTING
                E4: PATTERN RECOGNITION & IMAGE PROCESSING

PHD-CSCW-IV: Reviewing of Literature and Planning of the Proposed Research work with a tentative Title

PHD-CWCS-I : RESEARCH METHODOLOGY(PAPER-I)

Hours/Week: 4
Credits : 4

I.A.   Marks: 30
Exam. Marks: 70

UNIT-I
12 Hrs.

Fundamentals of Research: Introduction to Research issues in Computer Science, The objectives and dimension of research. Exploring research in Computer Science, Browsing the periodicals sections of the Library. **Tools of Research:** General Tools of Research, Library and its Resource as a Tool of Research, the Computer and its Software as a tool of research, Measurement as tool of research, Different measurements, statistics as a tool of research, the human mind as a tool of research, Language as tool of research.

UNIT-II
12 Hrs.

Focusing Your Research Efforts: Identifying and describing the research problem/Project, Stating the research problem, Indentifying sub problems and its Characteristics. Stating the hypotheses, Preparing a research proposal, a sample research proposal. **Reviewing the Related Literature: R**ole of the review, Locating related literature, Using library catalog, indexes, abstracts and other general references, Using the library's on line Databases, Organizing information collected, Evaluating, organizing and synthesizing the literature, writing a sample research proposal.

UNIT-III
12 Hrs.

Research Planning: Planning a Research Proposal, Basic format of a research proposal, Research Planning versus Research Methodology, Genera Criteria for a Research Project, Role of Data in Research, Linking Data and Research Methodology, Comparing Quantitative and Qualitative Approaches, **Writing the Research Proposal:** Organizing a Research Proposal, Practical applications **Quantitative Research Methodologies:** Descriptive Research Designs, Correlation Research, Development Designs, Computerizing Data collection in   Descriptive Research, Using the internet to collect Questionnaire Data, Choosing a Sample in a Descriptive Study, Sampling Designs, Sampling in Surveys of very Large Population, Identifying a Sufficient Sample Size, Bias in Research Sampling, Population Analysis for a Descriptive Survey.

UNIT-IV
12 Hrs.

Strategies for Analyzing Quantitative Data: Exploring and Organizing a Data Set, Analyze Data, Functions of Statistics, Considering the Nature of Data , Descriptive statistics, Point of Central Tendency, Measures of variability: Dispersion and Deviation, Measures of Association: Correlation, Inferential Statistics, Estimating population Parameters, Testing Hypotheses, Meta-analysis, Using Statistical Software Packages, Interpreting the Data, General Computational Tools.

Preparing the Research Report : Planning a research Report, Description of the Research, Description of the methods, Presentation of the Data, Interpretation of the data, Concluding the report, A graphic Organizer for the Research report, Organizing the Research Report, Principles of Writing , Practical Applications

Reference Book:

Paul D Leedy, And Jeanne Ellis Ormord, Practical Research Planning and Design, **Pearson Publication**, 9th Edition, 2010. (Chapters,1, 2,3,4,5,6,9,11 and 12).

PHD-CWCS-II : ADVANCED DATA STRUCTURES AND ALGORITHMS ANALAYIS
(PAPER-II)

Hours/Week: 4   **I A.   Marks: 30**
Credits : 4   **Exam. Marks: 70**

UNIT-I: ADVANCED DATA STRUCTURES

Abstract data structure, Time and space analysis of algorithms, Linear data structures, Stacks and Queues – ADT– Implementation and Applications – Trees – General– Binary – Binary Search – Expression Search – AVL – Introduction to Red Black trees and Splay tree – B Trees – Implementations – Tree Traversals, K-D trees, R-trees, Sorting and searching techniques.

UNIT-II: ALGORITHM ANALYSIS-I

Principles of Algorithm Analysis Techniques: Divide and Conquer: General method, Binary search, Maximum and Minimum, Merge sort, Quick sort, Selection sort, Strassen's Matrix multiplication
Greedy method: General method, Knapsack problem, Job sequencing with deadlines, MST, Optimal Storage on tapes, Optimal merge pattern, Single source shortest path.

UNIT-III: ALGORITHM ANALYSIS-II

Dynamic Programming: General method, Multistage graph, All Pair Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack; Backtracking: General method, 8-Queens problem, Sum of Subsets. Lower Bound Theory: Comparison trees, Lower bound thro' reduction, NP-hard and NP complete problems.

UNIT-IV: SETS, GRAPHS, PROBABILITY AND STATISTICS

Basics of Sets and Graphs: Set – Implementation – Basic Operations on Set – Priority Queue – Implementation – Graphs – Directed Graphs – Shortest Path Problem – Undirected Graph – Spanning Trees – Graph Traversals: hash table representation: hash functions: collision resolution: separate chaining: open addressing: linear probing: quadratic probing: double hashing: rehashing
Principles of discrete probability: Discrete distribution functions and axioms of probability; unions, intersections, and complements; properties of probabilities, principle of inclusion and exclusion
Principles of continuous probability: Density function for a continuous random variable, cumulative distribution functions.
Basics of Conditional Probability: Formal definition of conditional probability; Bayes' formula for inverting conditional probabilities; independent events; joint distribution functions; independent random variables. Conditional density functions for continuous distributions.
Distributions and Densities: Uniform continuous distributions; Normal (Gaussian) distribution; Chi-squared distribution.

REFERENCE BOOKS:

1.   The Design and Analysis of Computer Algorithms, Aho, Hop croft & Ullman – Addison Wesley Publishing Company.
2.   Horowitz, Ellis, and Sartaj Sahni. Fundamentals of Computer Algorithms. Potomac, MD: Computer Science Press, 1978. ISBN: 0914894226.
3.   Kingston, Jeffrey H. Algorithms and Data Structures: Design, Correctness, Analysis. Reading, MA: Addison-Wesley Publishing Co., 1991. ISBN: 0201417057.
4.   Knuth, Donald E. The Art of Computer Programming. 3rd ed. 3 vols. Reading, MA: Addison-Wesley, 1997. ISBN: 0201896834. ISBN: 0201896842. ISBN: 0201896850.
5.   Probability & Statistics for Engineers & Scientists, 8/E Ronald E. Walpole**,** Raymond H. Myers**,** Sharon L. Myers**,** Keying Ye, ISBN-10: 0131877119, ISBN-13: 9780131877115, Publisher: Pearson
6.   Probability and Statistics with Reliability, Queuing and Computer Science Application, K.S.Trivedi, Prentice Hall, 1982
7.   Wirth, Niklaus (1976) (in English). Algorithms + Data Structures = Programs. Prentice-Hall. ISBN 978-0-13-022418-7. 0130224189.

PHD-CWCS-III : DATA MINING AND KNOWLEDGE DISCOVERY(ELECTIVE-I)

Hours/Week: 4   **I.A.   Marks: 30**
Credits : 4   **Exam. Marks: 70**

UNIT-1   12 Hrs.

Introduction: Motivations, Data Mining Databases-Relational Data Bases, Data warehouse, Transactional Databases, Advanced Database systems and advanced Database applications. Data Mining Functionalities-Concept/Class Discrimination; characterizations and Discrimination, Association Analysis, Classification and Prediction, Cluster Analysis, Outlier Analysis and Evolution Analysis. Classifications of Data Mining Systems, Major issues in Data Mining.

Data Preprocessing: Introduction, Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation Discretization.

UNIT-1I   12 Hrs.

Data Warehouse and OLAP Technology: An Overview, Introduction to Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization: Data Cube Computation and Data Generalization: Efficient Method for Data Cube Computations, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT-1II   12 Hrs

Data Cube Computation and Data Generalization: Data Cube Computation and Data Generalization: Efficient Method for Data Cube Computations, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and a Road Map, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

UNIT-IV   12 Hrs

Classification and Prediction: Introduction, Issues regarding classification and prediction, classification by decision tree Induction, Bayesian classification, Rule based Classification, Classification by back propagation and advanced classification methods, prediction, classification accuracy.

Cluster Analysis: Introduction, Types of data in cluster analysis, A categorization of major cluster Methods, Partitioning methods, Hierarchical methods, Density-Base Methods, Grid-based methods, Model based Methods, Clustering High Dimensional Data, Outlier analysis. Introduction to Advanced Data Mining and their applications.

Text Book:
1.   Jaiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Morgan Kaufmann/Elsevier Science publisher, 2nd Edition. Reprint published by Harcourt (INDIA) Private Limited.
2.   Ian H. Writte, Eibe Frank and Mark A. Hall, DAta Mining Practical Machine Learning Tools and Techniques, Elsewher Pubication, Third Edition.

Reference Books:
1.   Arun K Pujari, Data Mining Techniques, University Press (INDIA) Pvt., 2003.
2.   Krzysztof J Cios; Witold Pedrycz and Roman Swiniarski, Data Mining Methods For Knowledge Discovery, Publisher: Boston : Kluwer Academic, 1998.

PHD-CWCS-III : ADVANCED COMPUTER NETWORKS (ELECTIVE-II)

Hours/Week: 4   **I.A. Marks: 30**
Credits : 4   **Exam. Marks: 70**

UNIT-I   12 Hours

Introduction: Introduction to wireless communication, Wireless data technologies, Frequencies for radio signals, antennas and signal propagation, need and types of multiplexing techniques, modulation types, use of spread spectrum.

Cell Coverage for Signal & antenna structures General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model- characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation. Characteristics of basic antenna structures, antenna at cell site, mobile antennas.

UNIT-II   12 Hours

Frequency features & Modulation Techniques: Frequency Management & Channel Assignment, Hand Off & Dropped Calls, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment. Handoff features, types of handoff and their characteristics, dropped call rates & their evaluation.
Modulation methods-Introduction to Digital modulation techniques, modulation methods in cellular wireless systems, OFDM. Block coding, convolution coding and Turbo coding. Multiple access techniques: FDMA, TDMA, CDMA; Time-division multiple access (TDMA), code division multiple access (CDMA), CDMA capacity, CDMA compared with TDMA.

UNIT-III   12 Hours

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems. Elements of Cellular Radio Systems Design and interference , General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

UNIT-IV   12 Hours

Digital mobile Phone Systems - GSM: mobile services, system architecture, radio interference, protocols, localization, and calling, hand over, security, new data services. Wireless LAN: Introduction, advantages and design goals for wireless LAN, Infrastructure, ad-hoc networks, IEEE 802.11: system and protocol architecture, physical layer, HIPERLAN protocol architecture and physical layer and MAC, Bluetooth physical and MAC layer. Wireless ad-hoc networks. Protocols for mobile computing: mobile network layer, mobile IP, Snooping TCP, Mobile TCP, Fast and selective retransmission and recovery, Transaction oriented TCP. Wireless Application Protocol.

Text books :
1. Mobile Communications – Jachen Schiller (Addison- Wesley)
2. Mobile Computing – Asoke K Talukder, Roopa R Yavgal, (TMH Publishing)
3. Mobile Cellular Telecommunications; 2nd ed.; William, C Y Lee McGraw Hill

Reference Books :
1. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
2. Wireless communication principles and practice, 2nd Ed, Theodore S Rappaport, Pearson Education.
3. Principles of Wireless Networks, Kaveh Pahlavan and Prashant Krishnamurthy: PHI
4. Wireless communication theory, Blake, pub: Thomson Delmar 2004.

PHD-CWCS-III : CLOUD AND GRID COMPUTING (ELECTIVE-III)

Hours/Week: 4   **I.A.   Marks: 30**
Credits : 4   **Exam. Marks: 70**

UNIT-I   **12 Hours**

Grid Computing : Introduction to Grid Architecture: Characterization of Grid, Grid related standard bodies. Grid types, Topologies, Components and Layers. Comparison with other approaches. System Infrastructure: Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA & WSRF, Introduction to Globus Toolkit 3 & GT 4. Semantic Grid & Autonomic Computing: Metadata & Ontology in semantic Web, Semantic Web Services, Layered Structure of Semantic Grid, Semantic Grid Activities, Autonomic Computing.

UNIT-II   **12 Hours**

Basic Services: Grid Security, Grid Monitoring, GMA, Review criteria overview of Grid Monitoring system – Autopilot. Grid Scheduling & Resource Management: Scheduling Paradigms, How Scheduling Works, Review of Condor.

UNIT-III   **12 Hours**

Cloud Computing :
Introduction to Cloud Computing: Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS / HAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations.

UNIT-IV   **12 Hours**

Virtualization, SOA & Cloud: Virtualization characteristics, Managing virtualization, Virtualization in cloud, Virtualization desktop and managing desktops in the cloud and security issues, characteristics of SOA, SOA and cloud. Cloud Storage and Data Security: Storage basics, Storage as a service providers, security, aspects of data security, data security mitigation, provider data and it's security.

Text Books:
1. The Grid (Chapter 1,2,3,4,5) Core Technologies by Maozhen Li, Mark Baker,John Wiley & Sons.
2. Cloud Computing for Dummies (Chapter 6,7) by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, Wiley India Edition,
3. Cloud Security & Privacy (Chapter 8) by Tim Malhar, S.Kumaraswammy, S.Latif, SPD,O'REILLY .

Reference books:

1. A networking Approach To Grid Computing by Daniel Minoli, John Wiley & Sons, INC Publication , (Chapter 1)
2. Cloud Computing: A Practical Approach by J.Vette, Toby J. Vette, Robert Elsenpeter, Tata McGraw Hill.
3. "Cloud Application Architectures", by George Reese, ISBN: 978-0-596- 15636-7, O'Reilly, 2009
4. "Cloud Computing and SOA Convergence in Your Enterprise: A Step-by- Step Guide", by David S. Linthicum, ISBN: 978-0-1360-0922-1, Addison Wesley, 2009

PHD-CWCS-III : PATTERN RECOGNITION & IMAGE PROCESSING
(ELECTIVE-IV)

Hours/Week: 4   **I.A.   Marks: 30**
Credits : 4   **Exam. Marks: 70**

UNIT-I   12 Hours

Basics of Pattern Recognition, Bayesian decision theory- Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, Discrete features Parameter estimation methods: Maximum-Likelihood estimation, Gaussian mixture models Expectation-maximization method, Bayesian estimation, Non-parametric techniques for density estimation: Parzen-window method, K-Nearest Neighbour method.

UNIT-II   12 Hours

Dimension reduction methods: Principal component analysis, Fisher discriminant analysis, Hidden Markov models for sequential pattern classification: Discrete hidden Markov models, Continuous density hidden Markov models, Linear discriminant function based classifiers: Perceptron, Support vector machines, Non-metric methods for pattern classification: Non-numeric data or nominal data, Decision trees, Unsupervised learning and clustering: Criterion functions for clustering, Algorithms for clustering: K-means, Hierarchical and other method, Cluster validation.

UNIT-II   12 Hours

DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS: Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.
IMAGE ENHANCEMENT TECHNIQUES: Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters : Smoothing – Sharpening filters – Homomorphic filtering.

UNIT-II   12 Hours

IMAGE SEGMENTATION AND REPRESENTATION: Edge detection – Thresholding - Region Based segmentation – Boundary representation: chair codes- Polygonal approximation – Boundary segments – boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors –Simple descriptors-Texture.
IMAGE COMPRESSION: Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG,Basics of Vector quantization.
IMAGE MORPHOLOGY , BASICS OF COLOUR IMAGE PROCESSING

Text Books:
1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
4. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.
5. Rafael C Gonzalez, Richard E Woods, Digital Image Processing - Pearson Education 2008.
6. William K Pratt, Digital Image Processing, John Willey (2001)
7. A.K. Jain, Fundamentals of Digital Image Processing. PHI, New Delhi (1995).
8. Chanda and Dutta Majundar – Digital Image Processing and Applications, Prentice Hall of India, 2000.
9. M. Sonka, V. Hlavac, and R. Boyle, Image Processing, Analysis, and Machine Vision, Thomson, 2008.