

SYLLABUS FOR M. PHIL. DEGREE IN COMPUTER SCIENCE (SF) Page 1

UNDER SEMESTER SYSTEM

2013-14



(Effective from January 01, 2013)

**P.G. Department of Computer Science & Applications**

**SAMBALPUR UNIVERSITY**

**Jyoti Vihar-768 019, Burla**

Mphil-611

**SOFTWARE ENGINEERING AND OOAD****Unit I**

**Managing software project:** Over view to software project , software product and software process, project management concepts , responsibility of software project manager , software project planning, metrics for project size estimation, project estimation technique, project scheduling technique (WBS,PERT,Gantt Chart,CPM) and tracking, staffing, over view to risk management, risk management activities, , software quality assurance, , software configuration management(SCM): Goals, objectives, SCM activities, SCM tools and standards.

**Unit II**

**Requirement Engineering and specification:** Requirement Engineering Definition, Requirement Engineering technique, software requirement and its objectives, Requirement Engineering Activities, Software Requirement Specification (SRS): Goals, Quality and characteristics of good SRS, Benefits, Uses and Components of SRS, SRS structure, Specification Technique, Formal Specification, Algebraic Specification and Model based specification.

**Unit III**

**Software Design Strategies and Methods:** What is good Software Design?, Good vs. Bad design, Cohesion and Coupling, Classification of Cohesion and Coupling, Software design Approach : Function oriented design and object oriented design, Overview to SA/SD Methodology: Structure Analysis ,Tools for Structure Analysis, DFDs. Designing and Developing DFD Models Shortcoming of DFD, Structured Design, Tools for Structure Design, Flow chart vs. Structure Chart, Transformation of DFD into Structure Chart, Detail Design.

**Unit IV**

**Object Oriented Software Engineering and Software Reliability and QM:** Conventional Method for Software Engineering: Design Concepts and principles. Architectural Design, Component level Design, User Interface Design, Software coding and testing Techniques, Software testing strategies: Black Box and White Box Testing, Integration and System testing, Object Oriented concepts and principles, Object Oriented Analysis, Object Oriented Design, UML, UML Diagram: USE Case model, CLASS Diagram, Inter action Diagram, Activity Diagram, State chart Diagram.

Software Reliability, Software quality, Software quality Management System, ISO Certification. Overview to CASE, CASE tool classification of CASE Tool, Characteristics CASE Tool, CASE for future.

Software Re- Engineering: What is Software Re- Engineering? Benefits of Software Re- Engineering, Re- Engineering Activities, Software Reverse Engineering: Goals, Types of Reverse Engineering.

## Reference Books:

1. Roger S. Pressman, "Software Engineering A Practitioners Approach", Mc Graw Publication.
2. Ian Sommerville, "Software Engineering", Pearson Education, Asia
3. Rajib Mall "Fundamentals of Software Engineering", PHI

## **Mphill-612**

## **(Elective) Digital Image Processing**

### **UNIT -I**

Digital image processing – fundamental steps in image processing – elements of image processing systems. Digital image fundamentals: A simple image model – sampling and quantization – some basic relationships between pixels. Introduction to Fourier transform – the discrete Fourier transform – properties of the two-dimensional Fourier transform.

Image Enhancement: Enhancement by point processing – spatial filtering – enhancement in the frequency domain – generation of spatial masks from frequency domain specifications – color image processing

### **UNIT -II**

Image restoration: Degradation model – diagonalisation of circulant and block circulant matrices – Algebraic approach to restoration – inverse filtering. Image compression: Fundamentals – image compression models – error-free compression – lossy compression – image compression standards.

### **UNIT -III**

Image segmentation: Detection of discontinuities – edge linking and boundary detection – thresholding -region oriented segmentation. Representation and description: representation schemes – boundary descriptors – regional descriptors. Elements of image analysis – Patterns and Pattern classes – decision theoretic methods – structural methods – interpretation

### **UNIT -IV**

Image processing – pattern recognition – relationship between image processing and pattern recognition. Object detection: introduction. Shape analysis: introduction – convex hull – convex hull based representation – fractals – fractals based image shape representation.

## **TEXT BOOKS :**

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image processing using MATLAB", Pearson Education, 2004
2. Rafael C. Gonzalez, Richard E. Woods, "Digital Image processing", 2nd ed., Prentice Hall, NJ., 2002
3. Russ J. C., "The image processing handbook", 3rd ed., CRC Press, 1999



Mphil-612

(Elective) ADVANCED COMPUTER NETWORK

### UNIT-I

Direct Link Network : Framing, Error Detection and correction, Reliable Transmission Ethernet(802.3), Wireless(802.11)System Architecture, Physical Layer, MAC Layer, MAC management, 802.11b, 802.11a, Switching and Forwarding, Bridges and LAN switches, Cell switching protocol in Data link Layer.

### UNIT-II

Packet Switching and Internetworking: Routing simple internetworking (I/P), Address subnetting global internet, multicast, broadcast, multiprotocol(BGP,OSPF etc.), mobile IP, DHCP, MANET, Congestion control Algorithms .

### UNIT-III

Transport Layer, Congestion control: TCP, UDP, Remote procedure call, Congestion control and Resource Allocation.

### UNIT-IV

Application Layer: Name services(DNS), e-mail(SMTP,MIME,IMAP), HTTP, SNMP, Multimedia Applications(RTDSIPH323), PGP, SSH(Secure Shell), Transport Layer Security, IP Security, Wireless Security.

### **TEXT BOOKS:**

1. Peterson L. and Davie S.B – Computer Networks( A System Approach)  
Kaufmann Publishers 4<sup>th</sup> Edition
2. Schiller J.- Mobile Communication- Pearson Education 2<sup>nd</sup> Edition

### **BOOKS REFERNCE :**

1. Tanenbaum S.-Computer Networks-Pearson Education,4<sup>th</sup> Edition
2. Data Communication and Networking- Fourazon B.-TMH publication
3. Comer D.E- Internetworking with TCP/IP-PHI publication
4. Taulkdar A.K. – Mobile Computing –TMH (Reprint 2009)

Mphil-612

**(Elective)Data Warehousing and Mining****UNIT -I**

Data Warehousing Introduction – Definition-Architecture-Warehouse Schema-Warehouse server-OLAP operations. Data Warehouse technology – Hardware and operating system-Warehousing Software – Extraction tools – Transformation tools – Data quality tools – Data loaders – Data Access and retrieval tools – Data Modeling tools – Fact tables and dimensions Data warehousing case studies : Data warehousing in Government , Tourism, Industry , Genomics data.

**UNIT -II**

Data Mining definition – DM Techniques – current trends in data mining -Different forms of Knowledge – Data selection , cleaning, Integration , Transformation, Reduction and Enrichment . Data: Types of data -Data Quality -Data Preprocessing -Measures of similarity and dissimilarity. Exploration : Summary statistics – Visualization.

**UNIT -III**

Association rules : Introduction – Methods to discover association rule – Apriority algorithm Partition Algorithm – Pincher search algorithm – Dynamic Item set algorithm – FP Tree growth algorithm. Classification : Decision Tree classification – Bayesian Classification – Classification by Back Propagation.

**UNIT -IV**

Clustering Techniques : Introduction – Clustering Paradigms – Partitioning Algorithms – K means & K Mediod algorithms – CLARA – CLARANS – Hierarchical clustering – DBSCAN – BIRCH – Categorical Clustering algorithms – STIRR – ROCK – CACTUS. Introduction to machine learning – Supervised learning – Unsupervised learning – Machine learning and data mining.

Web Content Mining – Web structure mining – web usage mining – Text Mining – Text Clustering Temporal Mining -spatial mining -Visual data mining – Knowledge mining.

**TEXT BOOKS:**

1. Arun k Pujari , “Data Mining Techniques”, University press , edition 2001.
2. Jaiwei Han, Michelinne Kamber , “Data Mining : Concepts and Techniques “
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, 2007.
4. T.Sushmita mitra, Tir ku Acharaya , “Data Mining Multimedia , Softcomputing & Bioinformatics”, Wiley Interscience publications , 2004.
5. Michal J A Berry , Gordon Linoff , “Mastering Data Mining” , John Wiley & Sons ,2000.



6. Alex Berson , Stephen J.Smith , “Data Warehousing , Data Mining & OLAP “, Tata McGrawhill
7. C S R Prabhu, “Data Warehousing – concepts , techniques and applications “,Prentice Hall of India, 2nd edition , 2002.

#### **REFERENCE BOOKS :**

1. David Hand, Heikki Mannila , Padhraic Smyth, “Principles of Data Mining”, the MIT Press, Massachusetts Institute of Technology , Cambridge.
2. Usama M Fayyad, Gregory Piatskey Sharpio, Padhr Smyth, Ramasamy Uthurusamy , “Advances in Knowledge discovery and data mining”.
3. Mehmed Kantardzix, ”Data Mining : Concepts Models, methods and algorithms”.
4. Mark Humphries , Michal W Hawkins & Michelle C dy, “Data warehousing architecture and implementation”, Prentice hall of India, 1999.
5. Margaret H.Dunham , ”Data Mining :Introductory and advanced topics”.
6. Sumathi, S.N. Sivanandam, “Introduction to Data Mining and its Applications “,Springer.

**Mphil-612**

**(Elective) Soft Computing**

#### **UNIT -I**

Fundamentals of ANN: The Biological Neural Network, Artificial Neural Networks Building Blocks of ANN and ANN terminologies: architecture, setting of weights, activation functions -McCulloch-pitts Neuron Model, Hebbian Learning rule, Perception learning rule, Delta learning rule.

#### **UNIT -II**

Models of ANN: Single layer perception, Architecture, Algorithm, application procedure -Feedback Networks: Hopfield Net and BAM -Feed Forward Networks: Back Propagation Network (BPN) and Radial Basis Function Network (RBFN) -Self Organizing Feature Maps: SOM and LVQ

#### **UNIT -III**

Fuzzy Sets, properties and operations -Fuzzy relations, cardinality, operations and properties of fuzzy relations, fuzzy composition.

Fuzzy variables -Types of membership functions -fuzzy rules: Takagi and Mamdani – fuzzy inference systems: fuzzification, inference, rulebase, defuzzification.

#### **UNIT -IV**

Genetic Algorithm (GA): Biological terminology – elements of GA: encoding, types of selection, types of crossover, mutation, reinsertion – a simple genetic algorithm – Theoretical foundation: schema, fundamental theorem of GA, building block hypothesis.

## TEXT BOOKS :

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.

## REFERENCE BOOKS :

1. Satish Kumar, Neural Networks – A Classroom approach, Tata McGraw-Hill, New Delhi, 2007.
2. Martin T. Hagan, Howard B. Demuth, Mark Beale, Neural Network Design, Thomson Learning, India, 2002.
3. B. Kosko, Neural Network and fuzzy systems, PHI, 1996.
4. Klir & Yuan, “Fuzzy sets and fuzzy logic – theory and applications, PHI, 1996.
5. Melanie Mitchell, An introduction to genetic algorithm, PHI, India, 1996.

Mphil-612

(Elective) Real Time SystemModule I

**Introduction:** What is Real Time? Application of Real Time System, A basic model of a Real Time System, Characteristics of Real Time System, Safety and Reliability, Types of Real Time tasks, Timing Constraints, Modeling Timing Constraints.

**Real Time Task Scheduling:** Some important concepts, Types of Real Time Task and their characteristics, Task Scheduling, Clock-Driven Scheduling, Hybrid Schedulers, Event-Driven Scheduling, Earliest deadline First(EDF) Scheduling, Real Monotony Algorithm(RMA), Some Issues Associated with RMA, Issues in Using RMA in Practical situations

Module II

**Handling Resources Sharing and Dependencies among Real-Time Task:** Resource Sharing among Real-Time Task, Priority inversion, Priority Inheritance Protocol (PIP) Highest Locker Protocol (HLP) Priority Ceiling Protocol (PCP) Different types of Priority I, Inversion under PCP, Important features of PCP, Some Issues in using a Resource Sharing Protocol, Handling Task Dependencies.

**Scheduling Real Time Task in Multiprocessor and Distributed Systems:** Multiprocessor Task Allocation, Dynamic Allocation of Task, Fault – Tolerant Scheduling of task, Clocks in Distributed Real Time Systems, Centralized Clock Synchronization, and Distributed Clock Synchronization.

Module III

**Commercial Real Time Operating Systems:** Time Services, Features of a Real Time Operating Systems, Unix as a Real Time Operating Systems , Unix based Real Time Operating Systems , Windows as a Real Time Operating Systems, POSIX, A Survey of Contemporary Real Time Operating Systems, Benchmarking Real Time Systems.



**Real Time Database:** Example Application of Real Time Database, Review of Basic Database concepts, Real Time Database, Characteristics of Temporal Data, Concurrency Control in Real Time Database , Commercial Real Time Database.

#### **Module IV**

**Real Time Communication:** Example of Application requiring Real Time Communication, Basic Concepts Real Time Communication in LAN , Soft Real Time Communication in a LAN , Hard Real Time Communication in a LAN , Bounded Access Protocols for LANs , Performance Comparison , Real Time Communication Over packet Switched Networks Qos Framework , Routing , Resource Reservation , Rate Control , Qos Models .

#### **Text Books:**

1. Real Time System, by Rajib Mall(Pearson Education)

#### **Reference Books:**

1. Liu," Real Time System", Pearson Education, 2001
2. Alan Burns , Andy Wellings , " Real Time System and Programming Language 3/e" , Addison Wesley.
3. Raymond A . Buhr and Donald L. Baily, "Introduction to Real Time System", prentice Hall.
4. Nissanke ," Real Time System", Prentice Hall.

Mphil-612

(Elective) **ADVANCE COMPUTER ARCHITECTURE**

#### **Unit I**

**Parallel Processing:** Definition, Theory of Parallelism. Parallel Computer Models, Parallelism in Uni-Processor Computers , Implicit Parallelism vs explicit Parallelism , Levels of Parallelism, Software Parallelism , Hardware Parallelism.

#### **Unit II**

**Condition of Parallelism :** Data and resource Dependencies, Control Dependence , Resource Dependence , Bernstein's condition , Hardware and Software Parallelism , Flow Dependence , Anti Dependence , Output Dependence , I/O Dependence , Unknown Dependence.

**Program Flow Mechanism:** Control Flow vs. Data Flow, Demand driven mechanism, Comparison of flow mechanism, Dataflow Computer Architecture, Static Dataflow & Dynamic Dataflow Computer, Communication Latency, Grain Packing & Scheduling in Parallel Programming Environment ,Program Partitioning, Fine Grain Program, Coarse Grain Program Graph.



**Unit III**

Parallel Interconnection System : Static & Dynamic Networks , Linear Array, Ring, Star, Tree, Mesh, Systolic Array, Choral Ring, Completely Connected Network, Cube Connected Cycles , Torus, K-ary-n cube, Barrel shifter, Single stage Interconnection Network, Multi stage Interconnection Network, Control structure, Node Degree, Diameter, Bi-section width, Symmetric, Functionality, Network Latency, Bandwidth, Scalability, Data Routing Functions :  
- Permutation, Perfect shuffle exchange, Hypercube Routing Functions.

Pipelining: Linear pipe line processor, Asynchronous and Synchronous models, speed up, Efficiency, Throughput, Non Linear pipe line processor, Instruction pipeline, Pipeline Hazards, Arithmetic pipeline.

**Unit IV**

Multiprocessor and Multicomputer: Hierarchical bus system, Crossbar and multiport memory, Cross point switch, Flynn's classification: SISD, SIMD, MISD, MIMD, Message passing, loosely coupled and tightly coupled system,

Vector processor, Memory hierarchy, CISE scalar processor, RISC scalar processor, C-Access and S-Access Memory organization. Basic Ideas on Parallel Algorithm, SIMD Algorithm for matrix multiplication.

Fault Tolerance and Reliability, Availability, System performance Attributes of parallel computers.

**Text Books:**

1. Advanced Computer Architecture, by Kai Hwang, Mc Graw Hill.
2. Introduction to Parallel Computing, 2<sup>nd</sup> Edition, Pearson Education By Ananth Grama, Anshul Gupta, George Karypis, Bipin Kumar

**Reference Books:**

1. Computer Architecture – A quantitative Approach By J.L Hennessy and D.A Patterson(Morgan).
3. Computer Architecture and Parallel Processing By Kai Hwang and F.A. Briggs, Mc Graw Hill, International

Mphill-613                      RESEARCH METHODOLOGY FOR SCIENCE STREAM

**Unit I**

Application of statistical concept/procedures, Data, Diagrammatic representation of data ,Probability, Measures of central tendency, Measures of dispersion, Skewness and Kurtosis, Normal distribution, Simple correlation, Multiple correlation , Regression analysis, Sampling-Simple random sampling, Stratified random sampling ,Systematic sampling .

**Unit II**

Testing of Hypothesis test ,  $\chi^2$  (Chi square ) ,t and F-tests: Analysis of variance, co-variance, Principal component analysis, Experimental design, Completely randomized block design, Latin square design, One-way analysis of variance, two-way analysis of variance, follow up tests, Non-parametric procedures, Writing of research reports.

**Unit-III**

Windows and/or Linux operating systems, Programming fundamentals, Basics of a high level programming language – C, Editing, compilation and running a program- storing data, Elementary numerical methods(as per requirement of the subject),Plotting graph, Preparing paper/report using Latex.

**Unit-IV**

Learning software packages specific to the subject

Books Recommended:

1. Bhattacharyya, D.K, Research Methodology, Excel Books, New Delhi,2<sup>nd</sup> Edition ,2006
2. Kothari, C.R, Research Methodology
3. Gupta ,S.C & Kapoor, V.K ,Fundamentals of Mathematical Statistics, S. Chand, New Delhi,
4. E. Balaguruswami,Programming in C.
5. P.K Sinha & Priti Sinha, Computer Fundamentals, BPB Publications.
6. P. Richard, Linux : The Complete Reference, Mc Graw Hill.
7. J.B Scarborough, Numerical Mathematical Analysis, Oxford & I.B.H.

Mphil-614- Practical

Mphil-615- Review of research papers published in referred journals - 4CH (Review Report -2 CH & Seminar -2 CH)

**Second Semester: (July to December) -20CH**

Course- 621- Seminar (At least two) - 2 CH

Course- 622 - Dissertation - 18 CH (*Interim 8 CH + Final 10 CH*)