

SHIVAJI UNIVERSITY KOLHAPUR

**Syllabi of PhD/ M.Phil. Course Work**

Department of Computer Science

Shivaji University, Kolhapur

2010-11

A] Ordinance/Rules/Regulations:-

(as applicable to M.Phil. / Ph.D. programme)

---

B] Shivaji University, Kolhapur

New/Revised Syllabus For Course Work of M.Phil. / Ph.D. programme

1. TITLE: Subject **Computer Science**

Optional/Compulsory under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- New/Revised Syllabus will be implemented from **June 2011-12** onwards.

3. PREAMBLE:-

The M.Phil. / Ph.D course work shall involve Three Papers Viz.

i) Research Methodology

ii) Recent Trends in Computer Science

iii) Research Trends in Computer Science

4. Duration:-

The M.Phil. programme shall be a full time regular course.

The duration of M.Phil. programme shall be of One year.

5. PATTERN:-

Pattern of Examination will be Annual in respect of M.Phil./Semester in respect of Ph.D.

FEE STRUCTURE:- (as applicable to regular/self supporting course): NA

i) Entrance Examination Fee(If applicable) – Rs\_\_\_\_\_(Non-refundable)

ii) Course Fee.

Particulars	Rupees
Tuition Fee	
Laboratory Fee	
Internet Fee	
Library Fee	
Annual/Semester Fee per student	

#### 6. ELIGIBILITY FOR ADMISSION:-

As per eligibility criteria prescribed for each course and the merit list in the qualifying examination.

#### 7. MEDIUM OF INSTRUCTIONS:-

The medium of instruction shall be in English or Marathi (as applicable to the course/programme concerned)

#### 8.STRUCTURE OF THE COURSE WORK FOR M.Phil/Ph.D. (No. of papers THREE)

Sr. No.	Subject/Papers	Marks
1	Research Methodology	100
2	Recent Trends in Computer Science	100
3	Research trends in Computer Science	100
	Total	300

#### 9.SCHEME OF TEACHING AND EXAMINATION:-

Sr. No.	Subject/Papers (Hrs/week)				Examination scheme		
	L	T	P	Total	Theory	Term work	Total
1	4	---	---	4	100	---	100
2	4	---	---	4	100	---	100
3	3	1	---	4	80	20	100

#### 10.SCHEME OF EXAMINATION:-

- The examination shall be conducted at the end of each Term/each academic year.
- The Theory paper shall carry 100 marks
- The evaluation of the performance of the students in the theory papers shall be on the basis of Annual Examination of 100 marks.
- Question Paper will be set in the view of the / in accordance with the entire Syllabus and preferably covering each unit of syllabi.

#### 11. STANDARD OF PASSING:-

As prescribed under rules and regulation for each degree/program.

12. NATURE OF QUESTION PAPER AND SCHEME OF MARKING:-

1. The question papers of papers I and II will consist of 100 marks and will have 8 questions each of 20 marks. Five out of eight questions are to be attempted.
2. Question paper for paper-III will be for 80 marks having 6 questions each of 20 marks on each unit. Each question will carry three sub questions of which two questions to be attempted. Out of total 6 questions Four questions are to be attempted. Nature of question paper is attached as separate sheet.
3. 20 Marks are reserved for a seminar. A student is expected to review a research paper in Computer Science, published during last five years in national or International Journal of repute. The candidate should give seminar on the review of the selected paper. The research paper preferably should be related to the topic of research.

13. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS (FOR REVISED SYLLABUS)

Sr. No.	Title of the Old Papers	Title of the New Papers
1	COMPUTER ARCHITECTURE AND DESIGN OF OPERATING SYSTEMS	Two more chances be given for the old candidate
2	DESIGN OF OPERATING SYSTEMS	Two more chances be given for the old candidate

14. SPECIAL INSTRUCTIONS, IF ANY

## Paper-I

### Title of the Paper: Research Methodology

#### Unit-1.

##### Research Methodology:

**An Introduction** Meaning of Research , Objectives of Research , Motivation in Research , Types of Research , Research Approaches ,Research Method versus Methodology ,Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, problem Encountered by Researchers in India . **Defining the Research Problem:** Definition of **Research** Problem, Selecting the Problem, Necessity of Defining the Problem Technique Involved in Defining a Problem (15)

#### UNIT - 2

**Measurement and Scaling Technique:** Measurement in Research, Measurement Scales, Sources of Error in Measurement, Tests of Sound Measurement, Technique of Developing Measurement Tools, Scaling, Meaning of Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques. **Processing and Analysis of Data:** Processing Operations, Some Problems in Processing, Elements /Types of Analysis, Statistics in Research, Measures of Central Tendency, Measures of Dispersion Measures of Asymmetry (Skewness), Measures of Relationship, Partial Correlation, Association in case of Attributes, Other Measures. (15)

#### UNIT - 3

**Sampling Fundamentals:** Need for Sampling, Some Fundamental Definitions, Central Limit Theorem, Sampling Theorem, Sandler's A-test, Concept of Standard Error, Estimation, Estimating the Population Mean, Estimating the Population Proportion, Sample size and its Determination, Determination of Sample Size through the Approach, Based on Precision Rate and Confidence Level, Determination of Sample Size through the Approach, Based on Bayesian Statistics. **Analysis of Variance and Covariance:** Analysis of variance(ANOVA), basic principles, technique, setting up analysis of variance table, short cut method for one- way ANOVA, coding method, two-way-ANOVA, ANOVA in Latin-Square-Design, Analysis of Co-variance(ANOCOVA), technique, assumption in ANOCOVA.

(15)

#### UNIT - 4

**Interpretation and Report Writing:** Meaning of Interpretation, Technique of Interpretation: Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing a Research Report. (15)

**Reference Books:**

1. Kothari C.R. (reprint 2011), Research Methodology – Methods and Techniques (New Age International , New Delhi)
2. Montgomery, Douglas C. (2007), Design and Analysis of Experiments.(Wiley India)
3. Montgomery, Douglas C. & Runger, George C. , Applied Stastics & Probability for Engineers (Wiley India)
4. Krishnaswamy, K.N. Sivkumar , Appa Iyer and Mathiranjana M.(2006), Management Research Methodology: Integration of Principles, Method and Techniques (Pearson Education, New Dehli)

## **Paper-II**

### **Title of the Paper: Recent Trends in Computer Science**

#### **UNIT I**

**(15 hrs)**

**Artificial neural network:** Fundamental concept and models of artificial neural system, Feed forward & feed back networks, perception learning rule, single layer perception classifiers, multilayer feed forward networks.

**Support vector machines:** problem formulation, Lagrangian theory, duality support vector classification, support vector regression implementation techniques.

#### **UNIT-II**

**(15 hrs)**

**Mobile computing and communication:** Introduction to Mobile Communications and Computing: Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services. (15 hrs)

#### **UNIT- III**

**(15 hrs)**

**Real Time Operating System:** Terminology, Systems Concepts, Real-Time definitions, Events and Determinism, CPU utilization, Real-Time System Design issues, example, common misconceptions, Hard versus soft real time system. System performance analysis and optimization: Response time calculation, interrupt latency, Time- loading and its measurement, Scheduling is NP complete, reducing response time and time loading, reducing memory loading I/O performance.

#### **UNIT IV:**

**(15 hrs)**

**GRID COMPUTING:** Early Grid Activities, Current grid activities, Overview of grid business area, Grid Infrastructure and its relationship with other distributed architectures.

Open grid service architecture (OGSA), Data management services, Overview of Globus GT3 Toolkit. Grid applications: Schedulers, Resource broker, load balancing, grid portals.

## **References:**

### **Paper-II : Recent trends in Computer Science**

#### **Unit I**

1. Critianini N and Shawe – Taylor John (2000) An introduction to support vector machines. Cambridge University press.
2. Zurada J.M Introduction to Artificial Neural Systems

#### **Unit-II**

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley. (Chapters 4, 7, 9,10, 11), second edition, 2004.
2. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028. (Chapters 11, 15, 17, 26 and 7)

#### **Unit- III**

1. Real Time system design and analysis: An Engineers handbook , Philip A. Laplante , 3rd edition PHI
2. Real time system by Jane W.S. Liu
3. Real time system design- Levi Shem Tov and Ashok K. Agrawal ( New York, Mc Graw hill)
4. Real time systems: C. M.Krishna , K. G. Shin (TMGh)

#### **Unit- IV**

1. Joshy Joseph, Craig Fellenstein, “Grid Computing”, IBM Press, 2004
2. Fran Berman, Anthony J.G Hey, Geoffrey Fox, “Grid computing: Making the global infrastructure a reality”, Wiley, ISBN: 0470853190  
([www.grid2002.org](http://www.grid2002.org))
3. [www.gridbus.org](http://www.gridbus.org), [www. Globus.org](http://www.Globus.org), [www.gridcomputing.com](http://www.gridcomputing.com),  
[www.gridforum.org](http://www.gridforum.org), [www.grid.org](http://www.grid.org)



### **Paper-III**

#### **Title of the Paper : Research Trends In Computer Science**

##### **Unit I:**

##### **Cloud Computing:**

**[15 hrs.]**

Definition, Characteristics, components, cloud provider, Organizational scenarios of clouds  
Administering and monitoring cloud services, benefits and limitations.

**Cloud Computing Architecture:** Cloud delivery models- SaaS, PaaS, IaaS.

Cloud Deployment Models- Public Cloud, Private Cloud External Cloud and Hybrid Cloud.

**Service oriented Architecture and the cloud.**

##### **Unit II:**

##### **Advance Computer Networks:**

**[15 hrs.]**

Introduction, overview of network building blocks, Network architecture with layers and protocols, Overview of data link concepts , IP addressing, forwarding, and routing , BGP and adaptive routing, Multi-Protocol Label Switching (MPLS), MPLS Architecture and related protocols , Traffic Engineering (TE) and TE with MPLS, Transport protocols and congestion control , Quality of Service (QoS) with MPLS technology, Network recovery and restoration with MPLS technology

Virtual Private Networks (L2, L3, and Hybrid), Metro Networks, Metro technologies ( Ethernet over SONET, Resilient Packet Rings, Ethernet transport), Metro Ethernet services, L2 switching, L3/L2VPNs for Metro, Pseudowire (PW) concept (multisegment/redundant PW's), Ethernet over MPLS, VPLS, Sensor Networks, Mobile Internet, Home networking, TriplePlay/IPTV, Internet of Things

##### **Unit III:**

##### **Fundamental Aspects in Digital Processing:**

**[15 hrs.]**

Digital signal processing, time and frequency domain, Z-Transform, Image processing of 2 dimensional images and 3 dimensional images: Point process, area process, frame process and geometric process, Frequency Transformations: Hilbert Transformation, Fast Fourier Transformation (FFT), Fast Hartley Transformation (FHT), Discrete Hartley Transformation (DHT), Discrete Cosine Transformation (DCT)

(5)

Histogram: Interpreting Histograms, Image Acquisition, Image Defects, Computing Histograms, Histograms of Images with More than 8 Bits: Binning, Example, Implementation, Color Image Histograms, Intensity Histograms, Individual Color Channel Histograms, Combined Color Histograms, Cumulative Histogram

(5)

Adaptive filters: Frequency domain adaptive filters, Least Mean Square (LMS) Algorithm, Normalized LMS Algorithm, Recursive Least Square (RLS) Algorithm

Morphology :Grayscale Morphology :Structuring Elements, Dilation and Erosion, Grayscale Opening and Closing, Implementing Morphological Filters: Dilation and Erosion, Opening and Closing

(5)

#### **Unit IV:**

##### **Machine Learning:**

[15 hrs.]

Introduction to Machine Learning: Algorithms, Types, machine learning techniques.

**Decision tree learning:** Introduction, Types, Formulae- Gini impurity, Information gain, Decision tree advantages, Limitations.

**Association rule learning:** Algorithms- Apriori algorithm, Eclat algorithm, FP-growth algorithm, K-optimal pattern discovery.

**Clustering:** Clustering Algorithms- Connectivity based clustering (Hierarchical clustering), Centroid-based clustering, Distribution-based clustering, Density-based clustering. Evaluation of Clustering Results- Internal evaluation, External evaluation, Applications.

**Bayesian networks:** Definitions and concepts- Factorization definition, Local Markov property, Developing Bayesian networks, Markov blanket, d-separation. Causal networks  
Methods for Pattern Classification.

#### **Unit V:**

##### **Advanced Computer Graphics:**

[15 hrs.]

The Modern Computer Graphics Package, Overview of OpenGL, a real time graphics package, Overview of Renderman RIB and SL languages, Shape and Shading

Advanced Geometric Modeling: Basic Geometric Primitives: Polygons and Lines, Other Geometric Primitives: Quadrics, Introduction to Parametric Curves and Surfaces, Other Parametric Curves and Surfaces: Bezier, B-Spline Curves and Surfaces

Advanced Topics: Volume Rendering, Cartoon Shaders, Nonphotorealistic Rendering

#### **Unit VI:**

##### **Advanced Algorithms and Applications: :**

[15 hrs.]

Problem solving, Probabilistic analysis and randomized algorithms, Perfect Hashing, The

Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, NP-hard problems,

Approximation algorithms, Online algorithms and competitive analysis. Linear-

Programming Algorithms: Structure of Optima, Interior Point. Computational geometry:

convex hull. Random Walks and Markov chains

## **References: Research Trends In Computer Science**

### **Unit I:**

1. Cloud Computing For Dummies

By Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper.

2. Cloud Computing, A Practical Approach

By Toby Velte, Anthony Velte, Robert Elsenpeter.

### **Unit II:**

1. Computer Networks: A Systems Approach (3rd Edition), by Larry Peterson and Bruce Davie. Morgan Kaufmann, 2003, ISBN: 1-55860-832-X

2. Computer Networking: A Top-Down Approach Featuring the Internet, by Jim Kurose and Keith Ross, Addison-Wesley, .ISBN: 0-201-61274-7

3. Metro Ethernet, by Sam Halabi, Publisher: Cisco Press , ISBN: 158705096X

4. Mesh Based Survivable Networks, by Wayne Grover, Publisher: Prentice Hall, ISBN: 013494576X

### **Unit III:**

1. Digital Signals – Application In Digital Speech Processing, Digital Image processing and consumer electronics by Manish Pradhan, JAICO Publishing House

2. Principles of Digital Image Processing – Fundamental Techniques by Wilhelm Burger & Mark J. Burge, Springer

3. Image Acquisition and Processing with LabVIEW by Christopher G. Relf, CRC Press

4. Microscope Image Processing by Qiang Wu, Fatima A. Merchant, Kenneth R. Castleman , Elsevier Inc.

### **Unit IV:**

1. New Advances in Machine Learning, Published by In-Teh,  
© 2010 In-teh

New Advances in Machine Learning, Edited by Yagang Zhang  
ISBN 978-953-307-034-6

2. Data Mining: practical machine learning tools and techniques,  
By Ian H. Witten, Eibe Frank

Second Edition (Morgan Kaufmann Series in Data Management Systems)  
Elsevier Inc. 2005

3. Data Mining Concepts and techniques

By Jiawei Han and Micheline Kamber

### **Unit V:**

1. Interactive Computer Graphics: A Top Down Approach with OpenGL", by Edward Angel, Addison-Wesley.

2. "The Visualization Toolkit: An Object-Oriented Approach to 3D Graphics", by Will Schroeder etc., Prentice Hall.

3. "Introduction to Computer Graphics", 2nd edition in C, by Foley etc., Addison-Wesley, 1996.
4. "Computer Graphics", 2nd ed., by Hearn and Baker, Prentice Hall.

**Unit VI:**

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein,  
"Introduction to Algorithms," Third Edition PHI 2010.

**Additional Reference Reading:**

Bio signal and Biomedical Image Processing MATLAB-Based Applications by JOHN L. SEMMLOW, Marcel Dekker Inc.

**Note:**

**Students can prepare for any Four Units.**

**M.Phil./ Pre. Ph. D. (Computer Science)**

**Paper-III: Research Trends in Computer Science**

[Total Marks 80]

Instructions

1. Attempt any Four questions.
2. All questions carry equal marks.

Q.1. Attempt any Two. [20]

- a] Unit I
- b] Unit I
- c] Unit I

Q.2. Attempt any Two. [20]

- a] Unit II
- b] Unit II
- c] Unit II

Q.3. Attempt any Two. [20]

- a] Unit III
- b] Unit III
- c] Unit III

Q.4. Attempt any Two. [20]

- a] Unit IV
- b] Unit IV
- c] Unit IV

Q.5. Attempt any Two. [20]

- a] Unit V

b] Unit V

c] Unit V

Q.6. Attempt any Two.

[20]

a] Unit VI

b] Unit VI

c] Unit VI