SWAMI RAMANAD TEERTH MARATHWADA UNIVERSITY, NANDED

School of Technology

Sub Centre, Latur

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड.

Syllabus for the

M.Phil. Computer Science

School of Technology

S.R.T.M.U.N., Sub-Centre, Latur

Academic Year 2012-2013

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SUB-CENTRE, LATUR

SCHOOL OF TECHNOLOGY

M.Phil. in Computer Science Syllabus

Paper	Title	Marks	Credit
COMP-101	Research Methodology	100	**4**
COMP -102	Recent Trends in Computer Science	100	**4**
COMP -103	Analysis of Algorithm	100	**4**
COMP -104	Elective-1		
	a. Digital Image Processing	100	**4**
	b. Software Engineering		
	c. Signal Processing		
COMP -105	Dissertation	150	**6**
COMP -106	*Viva-Voce*	50	**2**
COMP -107	Seminar	25	**1**
Total		**625**	**25**

All theory papers will carry 50 marks as internal and 50 marks as external. Internal marks will consist of two tests (20 marks each) and one seminar / tutorial of 10 marks. The internal marks will be given by respective college/campus Schools. The external exam for 50 marks will be conducted by the University. The candidate has to secure min. 50% marks in internal exam and external exam separately. Otherwise he/she will be declared failed.

Important note: Each theory paper, dissertation, *Viva-Voce* and seminar will form separate heads of passing. A candidate will have to obtain minimum 50% marks in each head of passing for getting M.Phil. Degree.

Passing Rules for M. Phil. courses:

Sr.	Marks	Grade	Grade point
1	100-90	A+	10
2	89-90	A	09
3	79-70	B+	08
4	69-60	B	07
5	59-50	C+	06
6	Less than 49 and FR	FR	0 (Fail)

The assessment of the seminar (COMP-107) will be made by the Head of the Department in the concerned subject, Research Guide and any two research guides in the campus Schools/College Department. The candidate will have to deliver minimum two seminars each carrying 12.5 marks. Among these two seminars, one seminar should be on the Dissertation.

If the candidate has secured minimum passing grade points in all the Heads of Passing and presented at least one research paper at Regional/State/National Level Conference/ Seminar/Symposia, then the student shall be allowed to present pre-M.Phil. Dissertation seminar and to submit the Dissertation. *Viva-Voce* (COMP-106) on Dissertation will be arranged later on. This *Viva-Voce* will be delivered by the candidate only after receiving the satisfactory report and assessment (marks) of the dissertation by the referee(s).

In case of Dissertation, the marks and grades awarded by the external referee shall be considered as final. If external referee has suggested modifications in the Dissertation, the candidate shall resubmit the Dissertation after suitable modifications within a period of two months from the declaration of the first result. In case of rejection of Dissertation, the candidate will have to resubmit the Dissertation within a period of six months and a fresh referee panel may be appointed for evaluation of the resubmitted Dissertation. Only one resubmission of the dissertation shall be allowed in the academic session. If the evaluation report/mark is not satisfactory, then the candidate has to reappear for *Viva-Voce*. In case of course work, a student who does not get the minimum passing grade point he/she has to reappear the examination in that course and only two chances will be given for re-examination.

COMP-101: Research Methodology

Unit-1: Introduction and Methods of Research

Meaning, Concept, nature steps types and characteristics of research, Scientific Inquiry

Philosophical and Sociological foundations of research, Interdisciplinary approach and its implications in various research areas. Qualitative and quantitative methods of research like Historical, case study, ethnography, ex-post facto, documentary, and content analysis, survey (Normative, descriptive, evaluative etc.) field and laboratory experimental studies, Characteristics of methods and their implications in research area.

Unit-2: Development of research proposal:

Research proposal and its elements, Formulation of research problem-criteria of sources and definition, Development of objectives and characteristics of objectives, Development hypotheses and applications.

Unit-3: Methods of data collection:

Concept of sampling and other concepts related to sampling, Probability and non-probability samples, their characteristics and implications, Tools of data collections, their types, attributes and uses, Redesigning, research tools-like questionnaire, opinnaere, observation, interviews, scales and tests etc.

Unit-4: Methods of data analysis:

Analysis of qualitative data based on various tools, Analysis of quantative data and it presentation with tables, graphs etc., Statistical tools and techniques of data analysis-measures of central tendency, dispersion, Decision making with hypothesis testing through parametric and non parametric tests, Validity and delimitations of research findings.

Unit-5: Report writing and evaluations:

Principles of report writing and guide lines according to style manuals, Writing and presentation of preliminary, main body and reference section of report, Evaluation of research report.

Readings:

1. Bajpai S. R. (1975) Methods of Social Survey and Research, Kitabghar, Kanpur.
2. Hans Raj (1988) Theory and Practice in Social Research, Surjeet Publication, Kolhapur.
3. Krishnaswami O. R. (1988) Methodology of Research in Social Science, Himalaya Pub. House.
4. Sadhu, Singh, Research Methodology in Social Science
5. Bhandarkar, Research Methodology
6. Kothari, C. R. (2005) Quantitative Technique, New Delhi, Vikas Publication House.
7. Gautam, N. C. (2004) Development of Research tools, New Delhi, Shree Publishers.
8. Gupta, Santosh (2005) Research Methodology and Statistical Techniques, Deep and Deep Publications.
9. Chandera A. and Saxena T. P. (2000) Style Manual, New Delhi, Metropolitan Book Comp. Ltd.

10. Shukla, J. J. (1999) Theories of Knowledge, Ahmadabad, Karnavati Publication.
11. Bhattacharya, D. K. (2004) Research Methodology, New Delhi, Excel Books.
12. Brymann, Alan and Carmer, D. (1995) Qualitative data analysis for social scientist, New York, Routledge, Publication.
13. Best J. W. and Khan J. V. (2005) Research in Education New Delhi, Prentice Hall India.

COMP-102: Recent Trends in Computer Science

Unit 1: Neural Network

Biological Neuron and their Artificial Neuron , McCulloch-Pits Neuron Model, Perceptron Classification , Linearly Separability, NOR Problem ,Overview of Neural Network Architecture ,Learning Rules ,Supervised Learning ,Unsupervised Learning, Perceptron Learning , Reinforcement Learning ,Delta Learning Rule.

Unit 2: Fuzzy Logic

Introduction to Fuzzy Logic, Crisp Sets: an Overview : Fuzzy Sets: Basic Types ,Fuzzy Sets: Basic Concepts , Fuzzy Sets Vs Crisp Sets ,Additional Properties of alpha cuts ,Presentation of fuzzy sets , Extension principle for fuzzy sets, Fuzzy complements, Fuzzy Union, Fuzzy Intersections, Crisp & Fuzzy Relation, Binary, Fuzzy Relation, Binary Relation on single set, Fuzzy Equivalence Relations, Fuzzy Compatibility Relation, Fuzzification, defuzzification, Fuzzy Logic Control System.

Unit 3: Network Security

Cryptography; Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, One-Time Pads, Two Fundamental Cryptographic Principles; Symmetric Key Algorithms; DES-The Data Encryption Standards, AES – The Advances Encryption Standard; Public Key algorithms; RSA, Other Public Key algorithms; Digital Signatures, Symmetric-Key Signature, Public key Signature, Message Digests.

Unit 4: 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.

Unit 5: Geographical Information System (GIS)

Introduction, Maps and Geospatial Data, Representation of GIS data, Remote Sensing and Geographical Information system integration, GIS issues and prospectus.

Readings:

1. S. N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Wiley-India, 2008.
2. D.E. Goldberg, Genetic algorithms, optimization and machine learning, Addison Wesley 2000.
3. Melanie Mitchell, An introduction to genetic algorithm, PHI, India, 1996.
4. Concepts and Techniques of Geographic Information System, C. P. Lo Albert K. W Yeung, 2nd edition, PHI, publication, New Delhi, 2009
5. Remote Sensing and Geographical information System by M. Anji Reddy, 3rd Edition, BS Publication, Hyderabad, 2010.
6. Principles of Geographical Information System Peter Burrough and R. A McDonnell, Oxford University Press, 2011.

COMP-103: Analysis of Algorithm

Unit 1: Introduction

Importance of Analysis of algorithm, Asymptotic notations, Algorithmic complexity, Types of Data structure, Operations on Data Structure.

Unit 2: Divide and conquer

General methods, Binary Search, Merge sort, Quick Sort, Selection Sort, Convex Hull.

Unit 3: GA and DP

Greedy Algorithm: Methods, Algorithm, Knapsack problem, spanning tree

Dynamic programming: method, multi stage graphs, Optimal Binary Search tree, 0/1 knapsack problem, Travelling salesman problem. Greedy Algorithm Vs Dynamic Programming

Unit 4: NP –Hard and NP Complete problems

Basic concepts, Cook's theorem, NP Hard graph problem, NP-Hard scheduling problems, NP-Hard code Generation

Unit 5: Basic traversal and Search Techniques

Techniques for Binary Tree, Technique fro Graph, connected component and spanning tree, Hasing, Hash function and Universal Hashing,

Readings :

1. Saymour Lipscrutz , Introduction to data structure ,TMH
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest , Introduction to Algorithms, PHI
3. A.V.Aho, J.E.Hopcroft, J.D.Ullman Design and Analysis of Algorithms, (Addison Wesley)
4. E.Horowitz, S.Sahni , Fundamentals of Computer Algorithms , Galgotia
5. K.Melhorn ,Data Structures and Algorithms - Springer Verlag
6. P.W.Purdom, Jr. and C.A.Brown, Holt Rhinehart, The Analysis of Algorithms

COMP-104: Digital Image Processing

Unit 1: Fundamental of Digital Image Processing

What Is Digital Image Processing?, The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing

Components of an Image Processing System, Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing

Unit 2: Filtering in spatial and Frequency domain

Some Basic Intensity Transformation Functions, Histogram Processing , Fundamentals of Spatial Filtering , Smoothing Spatial Filters , Sharpening Spatial Filters , The Discrete Fourier Transform (DFT) of One Variable, Extension to Functions of Two Variables, Some Properties of the 2-D Discrete Fourier Transform, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters

Unit 3: Morphological Image Processing

Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms, Gray-Scale Morphology

Unit 4: Image Segmentation

Point, Line, and Edge Detection, Thresholding, Region-Based Segmentation, Segmentation Using Morphological Watersheds, the Use of Motion in Segmentation

Unit 5: Representation, Description and Recognition

Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Relational Descriptors, Patterns and Pattern Classes, Recognition Based on Decision-Theoretic Methods, Structural Methods

Readings:

1. Rafael c. Gonzalez, Richard Woods and Steven L Eddins **Digital Image Processing**, 2nd edition, Mc Graw Hill, New Delhi.
2. A. K. Jain **Fundamental of Digital Image processing**
3. john C. Russ **The Image processing Handbook** , 3rd edition CRC Press

COMP-104: Software Engineering

Unit 1: Formal Methods

Basic Concepts, Mathematical Preliminaries, Applying Mathematical Notation for Formal Specification, Formal Specification Languages, Using Z to Represent an Example Software Component, The Ten Commandments of Formal Methods, Formal Methods—The Road Ahead

Unit 2: Component-Based Software Engineering

Engineering of Component-Based Systems, The CBSE Process, Domain Engineering, Component-Based Development, Classifying and Retrieving Components

Unit 3: Client/Server Software Engineering

The Structure of Client/Server Systems, Software Engineering for c/s Systems, Analysis Modelling Issues, Design for c/s Systems, Testing Issues.

Unit 4: Web Engineering

The Attributes of Web-Based Applications, The Web E - Process, A Framework for Web E , Formulating/Analysing Web-Based Systems, Design for Web-Based Applications, Testing Web-Based Applications, Management Issues.

Unit 5: Computer-Aided Software Engineering

What is CASE?, Building Blocks for CASE, A Taxonomy of CASE Tools, Integrated CASE Environments, The Integration Architecture, The CASE Repository.

Readings:

1. Roger S. Pressman Software Engineering: A practitioner's Approach , 6th Edition, The McGraw-Hill Higher Education 2010
2. W S Jawadekar Software Engineering
3. Lan Sommerville Software Engineering
4. Richard Fairley ,Software Engineering, TMH
5. David Gustafson, Software Engineering
6. Meilier Page, Practical Guide in Structured System Design
7. Jalote , Software Project Management

COMP – 104: SIGNAL PROCESSING

Unit I: Signals and signal processing

Characterization and classification of signals, typical signal processing operations, signal processing applications, Digital Signal processing, discrete time signal in Time and Transform Domain. Signals Described in Math Form, the Unit Step Function, The Unit Ramp Function, The Delta Function Sampling Property of the Delta Function, Sifting, Property of the Delta Function

Unit II: Fourier Series and *The Fourier Transform*

Fourier Series : Wave Analysis, Evaluation of the Coefficients, Symmetry, Waveforms in Trigonometric Form of Fourier Series, Gibbs Phenomenon, Alternate Forms of the Trigonometric Fourier Series, Circuit Analysis with Trigonometric Fourier Series, The Exponential Form of the Fourier Series , Line Spectra, Computation of RMS Values from Fourier Series, Computation of Average Power from Fourier Series, Numerical Evaluation of Fourier Coefficients.

Fourier transformation : Definition and Special Forms , Special Forms of the Fourier Transform ,Properties and Theorems of the Fourier Transform, Fourier Transform Pairs of Common Functions , Finding the Fourier Transform from Laplace Transform, Fourier Transforms of Common Waveforms, Using MATLAB to Compute the Fourier Transform.

Unit III: The DFT and the FFT Algorithm

The Discrete Fourier Transform (DFT) ,Even and Odd Properties of the DFT, Properties and Theorems of the DFT,T he Sampling Theorem , Number of Operations Required to Compute the DFT, The Fast Fourier Transform (FFT)

Unit IV: Analog and Digital Filters

Filter Types and Classifications, Basic Analog Filters, Low-Pass Analog Filters, Design of Butterworth Analog Low-Pass Filters, Design of Type I Chebyshev Analog Low-Pass Filters, Other Low-Pass Filter Approximations, High-Pass, Band-Pass, and Band-Elimination Filters,

Unit V: Applications of Digital Signal Processing

Dual tone multifrequency signal detection, Spectral analysis of sinusoidal signal, spectral analysis of non stationary signals, Spectral analysis of random signals, Musical sound processing, Transmultiflexers, Discrete-Time Analytic signal generation.

Readings:

1. Digital Signal processing – a computer base approach by Sanjit K. Mishra (MGH)
2. Signals and Systems - Steven T. Karris (Orchard Publications)
3. L. R. Rabiner and R. W. Schafer, *Digital Processing of Speech Signals.* Englewood Cliffs, New Jersey: Prentice-Hall, 1978
4. D.O. Shaughnessy, *Speech Communication: Human and Machine.* India: University Press , 2001.

COMP-105: Dissertation

There will be a research based Dissertation under this category of evaluation and passing. The student shall undertake a research based hypothesis/project as per the field of expert guidance available at the course work place/school. A committee comprising the Director, HOD and all recognized supervisors/guides will allocate the students their supervisors as per the suitability of the research facilities/expertise. The standard of the Dissertation shall be as per UGC guidelines and of the University.

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