

**ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**Chennai-600 008**

## **Syllabus**

**(Offered from the academic year 2016-2017)**



**Master of Philosophy**

**in**

**Computer Science**

**(under Autonomous Pattern – Self Supporting stream)**

# **ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)**

**CHENNAI - 600 008**

## **M. Phil - COMPUTER SCIENCE (Full -Time)**

**( under Autonomous Pattern – Self Supporting stream)**

### **1. ELIGIBILITY**

All candidates should have passed a two or three year PG degree course with Computer Science / Computer Applications or equivalent as major after three year Bachelor's degree course and Higher Secondary course of two year duration after 10 year SSLC (i.e.10+2+3+2/3 years of study).

**Candidates belonging to the following categories are eligible to register for Full Time M. Phil programme.**

A candidate having a minimum 55% (for SC/ST candidates the minimum eligibility is 50%) marks and above in the Master's degree in Computer Science / Applications / Information Technology and working as Full-time Research Fellows / Technical Assistants / Research Assistants in time-bound Research schemes.

### **2. DURATION**

The duration of M. Phil (full time) programme shall extend over a period of one academic year (12 months) commencing from 1<sup>st</sup> August.

### **3. COURSE OF STUDY**

The course of study for M. Phil., degree programme shall consist of three written papers under Part-I and a Dissertation under Part-II.

#### **WRITTEN PAPERS (UNDER PART I)**

Paper I : Research Methodology (Research Methods of the concerned discipline)

Paper II : Advanced Technologies in Computer Science

Paper III : Specialization Paper (Pertaining to the area of specialization chosen by the candidate and / or research Supervisor's specialization)

## **DISSERTATION (UNDER PART II)**

Candidate shall be required to choose a research problem in her chosen area of research and submit a dissertation incorporating the results of her investigation, carried out under the supervision of a recognized supervisor.

### **4. REGISTRATION**

All candidates who are admitted into M. Phil programme (Full-time) will be registered under the supervision of recognized supervisors to do research in the chosen topics.

### **5. ATTENDANCE**

Candidates admitted to M. Phil. programme (Full-time) shall secure 75% attendance during the entire course including short-term training programme, workshop, seminar, conference, etc., attended by them outside the college on the recommendation of the research supervisor and with prior permission of the Head of Department and Principal of the college.

### **6. EVALUATION**

#### **(i) PART – I: CORE and SPECIALIZATION**

There shall be **two** tests of two hours duration (Continuous Internal Assessment Test(s)) and **one** External examination of three hours duration in each course during each semester. Continuous Assessment will be evaluated by one or more participatory tools such as objective tests, assignments, paper presentation, laboratory activities etc., whichever would be suitable to the course.

For the specialization paper the question paper setting and the corresponding end semester evaluation will be carried out by the concern Research Supervisor.

Duration of examination: 3 hours.

marks: 100.

#### **(ii) PART – II: DISSERTATION AND VIVA-VOCE:**

CA Marks	: 50
End Semester Marks	: 150
Total Marks	: 200

**7. QUESTION PAPER PATTERN:**

<b>NATURE OF THE QUESTION</b>	<b>MAXIMUM MARKS - 100</b>
Definitions, Descriptions, Evaluation, Understanding Descriptions / Problems/ Application /Analysis / Synthesis / Evaluation.	<p><b><u>PART - A ( 5X5=25 marks)</u></b></p> <p>Can choose <b>5 questions of internal choice</b> covering all the five units.</p> <p><b><u>PART - B (5X15=75 marks)</u></b></p> <p>Can choose <b>5 Questions of internal choice</b> covering all the five units</p>

## COURSE PROFILE

### (i) PART – I: CORE and SPECIALIZATION

COURSE	PAPER CODE	PAPER TITLE	HRS /WK	CREDITS	CA MARKS	END - SEM MARKS	TOTAL
PART I	18M16/RMY	RESEARCH METHODOLOGY	6	5	40	60	100
	18M16/ATC	ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE	6	5	40	60	100
	18M16/DWM	1. DATA WAREHOUSING AND MINING	6	5	40	60	100
	18M16/DIP	2. DIGITAL IMAGE PROCESSING					
	18M16/NLP	3. NATURAL LANGUAGE PROCESSING					
	18M16/CCG	4. CLOUD COMPUTING					
	18M16/CNS	5. CRYPTOGRAPHY AND NETWORK SECURITY	6	5	40	60	100
	18M16/ANN	6. ARTIFICIAL NEURAL NETWORKS					
PART II	18M16/DIS	DISSERTATION		21	50	150	200
<b>TOTAL CREDITS:</b>				<b>36</b>			

## COURSE PROFILE

S.NO	Title of the Paper	Core/Specilization	Credits
1.	Paper-I: Research Methodology	Core	5
2.	Paper-II: Advanced Technologies in Computer science	Core	5
3	<b>Paper-III:</b> 1. Digital Image Processing 2. Cryptography and Network Security 3. Natural Language Processing 4. Cloud Computing 5. Cryptography and Network Security 6. Artificial Neural Networks	Specialization	5
4.	DISSERTATION		21
	<b>Total Credits</b>		<b>36</b>

**M.Phil., Computer Science ( 2014-15 onwards)**

<b>CORE</b>	<b>TITLE OF THE PAPER</b>	<b>PAPER CODE</b>
<b>Paper-I:</b>	<b>Research Methodology</b>	<b>18M16/RMY</b>
<b>Paper-II:</b>	<b>Advanced Technologies in Computer science</b>	<b>18M16/ATC</b>
<b>Paper-III: SPECIALIZATION</b>	<b>1. Data warehousing and Mining</b>	<b>18M16/DWM</b>
	<b>2. Digital Image Processing</b>	<b>18M16/DIP</b>
	<b>3. Natural Language Processing</b>	<b>18M16/NLP</b>
	<b>4. Cloud Computing</b>	<b>18M16/CCG</b>
	<b>5. Cryptography and Network Security</b>	<b>18M16/CNS</b>
	<b>6. Artificial Neural Networks</b>	<b>18M16/ANN</b>
<b>4.</b>	<b>Dissertation</b>	<b>18M16/DIS</b>

(ii) **DISSERTATION AND VIVA-VOCE:**

<b>Continuous Assessment (Internal Guide)</b>	<b>Marks</b>
Dissertation work and Oral Presentation	40
Viva –Voce	10
<b>Total</b>	<b>50</b>

<b>External Assessment(Internal Guide &amp; External)</b>	<b>Marks</b>
Choice of Subject & Review of Literature	10
National , International Conference /Journal Communicated /presented	20
Organization & Interpretation	20
Project Presentation	20
Final Report	30
Viva-Voce	50
<b>TOTAL</b>	<b>150</b>



## **SYLLABUS - PART I**

**PAPER I: RESEARCH METHODOLOGY**

**PAPER II: ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE**

- PAPER III:**
- 1. DATA WAREHOUSING AND MINING**
  - 2. DIGITAL IMAGE PROCESSING**
  - 3. NATURAL LANGUAGE PROCESSING**
  - 4. CLOUD COMPUTING**
  - 5. CRYPTOGRAPHY AND NETWORK SECURITY**
  - 6. ARTIFICIAL NEURAL NETWORKS**

**PAPER I**  
**RESEARCH METHODOLOGY**

**CORE PAPER: I**

**CREDITS: 5**

**COURSE CODE: 18M16/RMY**

- UNIT I    **RESEARCH PROBLEM** : The research problem – Sources of research problem – Information, how to deal with it – Criteria / characteristics of a good research problem – Errors in selecting a good research problem – Types of research – Nature and use of arguments.
- UNIT II    **SAMPLING DESIGN AND SCALING TECHNIQUES** : Census and Sample survey – Steps in Sampling Design – Different types of Sample Designs – Complex Random Sampling Designs – Measurement scales – Techniques of Developing Measurement Tools – Scaling – Important Scaling Techniques.
- UNIT III    **METHODS OF DATA COLLECTION AND ANALYSIS OF DATA** : Collection of Primary Data – different types – Some other methods of Data Collection – Collection of Secondary Data – Processing Operations – Types of Analysis – Measures of Central tendency – Measures of Dispersion.
- UNIT-IV    **EXPERIMENTS AND REPORTS**: Design of Experiments – Tools of Research –. Research Report – Action Research – Organization of Statistical Data – Measures of Central Tendency – Measures of Variability.
- UNIT-IV    **CASE STUDY**: Presentation by students on their area of research.

**BOOKS FOR REFERENCES:**

1. Kothari, C.R., “Research Methodology: Methods and Techniques”, 2nd Edition, New Age International, New Delhi, 2012.
2. Nicholas Walliman, “Your Research Project”, 2nd Edition, Vistaar Publication, New Delhi, 2005.
3. Richard A. Johnson, “Miller and Freund’s Probability and Statistics for Engineers”, 8th Edition, Pearson Education, Asia, 2011.

## **PAPER II**

### **ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE**

**CORE PAPER: II**

**CREDITS: 5**

**COURSE CODE: 18M16/ATC**

- UNIT I CLIENT/SERVER TECHNOLOGY:** Client/Server Computing: Introduction – Building blocks – Clients, Servers and Operating systems – NOS Middleware – RPC, Messaging and Peer-to-Peer - Client/Server with Distributed Objects – Distributed objects and components, CORBA, COM+.
- UNIT II WEB TECHNOLOGY, XML, SOA AND WEB SERVICES:** XML: XML Basics- Components of XML- DTD-SOAP Message Structure-Web Services- Characteristics of SOA- Anatomy of SOA-SOA platform basics- SOA Support in J2EE.
- UNIT III OVERVIEW OF COMPUTING TECHNOLOGIES:** Big Data analytics – Big Data Technologies – Hadoop and Streams – Distributed Computing – Fully distributed processing systems – Networks and Interconnection structures – Designing a distributed processing system.
- UNIT IV MOBILE TECHNOLOGIES:** Wireless transmission- Multiplexing-Modulations - Telecommunication Systems: GSM - Satellite Systems - Wireless LAN - Mobile Network Layer – Transport Layer – Application Layer – Case studies NS2, GLOMOSIM, Programming platforms.
- UNIT V ADVANCED 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- Spanning Trees –Graph Traversals :hash table representation :hash functions - collision resolution - separate chaining open addressing - linear probing - quadratic probing -double hashing –rehashing.

## **BOOKS FOR REFERENCES:**

### **UNIT - I**

1. Robert Orfali, Dan Harkey, Jeri Edwards, “Client/Server Survival Guide”, Wiley – India, 2011.

### **UNIT - II**

1. “XML, Web services and the Data Revolution”- Frank. P. Coyle – Pearson Education, 2002
2. “Service oriented Architecture: Concepts, Technology and Design”- Thomas Erl- Pearson Education, 2005

### **UNIT - III**

1. Arvind Sath, “Big Data Analytics: Disruptive Technologies for Changing the Game”, MC Press, LLC, 2012.
2. Garry Turkington, “Hadoop Beginner's Guide: Learn how to crunch big data to extract meaning from the data avalanche”, Packt Publishing Limited, 2013
3. Uyless D.Black, “Data Communications & Distributed Networks”, Prentice Hall, 1997.

### **UNIT - IV**

1. Jochen Schiller, “Mobile Communication”, Pearson Education , 2014.
2. William Stallings, “Wireless Communications & Networks”, Pearson Education, 2014.

### **UNIT – V**

1. Mark Allen Weiss, —Data Structures and Algorithm Analysis in C++||, Pearson Education, 2002.
2. Aho Hopcroft Ullman, —Data Structures and Algorithms||, Pearson Education
3. Horowitz Sahni, Rajasekaran , —Computer Algorithms||, Galgotia, 2000.

## **PAPER-III**

### **1. DATA WAREHOUSING AND MINING**

**ELECTIVE PAPER: I**

**CREDITS: 5**

**COURSE CODE: 18M16/DWM**

- UNIT I Introduction – Why Data Mining? What is Data Mining? What kinds of Data can be mined? What kinds of Patterns can be Mined? Technologies used- Kinds of applications targeted – major issues - Know your Data – Data Objects and Attribute Types - Basic Descriptions of Data – Data Visualization – Measuring Data Similarity and Dissimilarity.
- UNIT II DATA PREPROCESSING – Overview- Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization - Data Warehousing and Online Analytical Processing – Basic Concepts – Data Warehouse Modeling – Data Warehouse Design and Usage – Data Warehouse Implementation – Data Generalization.
- UNIT III Data Cube Technology – Data Cube Computation and Methods – Exploring Cube Technology – Multidimensional Data Analysis - Mining Frequent Patterns – Basic concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods.
- UNIT IV CLASSIFICATION - Basic concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – Advanced Methods – Bayesian Belief Networks – Back Propagation – Support Vector Machines.
- UNIT V Cluster Analysis - - Partitioning methods –Advanced Cluster Analysis – Clustering High Dimensional Data – Network Data - Outlier Detection – Outlier Detection Methods – Data Mining Trends and Research Frontiers.

#### **BOOK FOR REFERENCES:**

1. J. Han, M. Kamber, “Data Mining: Concepts and Techniques”, Morgan Kauffman, 2011.
2. Margaret H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education 2004.

## **PAPER-III**

### **2. DIGITAL IMAGE PROCESSING**

**ELECTIVE PAPER: II**

**CREDITS: 5**

**COURSE CODE: 18M16/DIP**

**UNIT I:** Introduction To Image Processing: 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.

**UNIT II:** Intensity Transformations And Spatial Filtering: Intensity Transformation functions – Histogram processing – Fundamentals of Spatial filtering-smoothing spatial filters.

**UNIT III:** Geometric Transformations And Image Registration: Transforming points-Affine transformations-projective transformations-applying geometric transformations to images-image coordinate systems in MATLAB-image interpolation-image registration.

**UNIT IV:** Wavelets And Multi resolution Processing: Background-multi resolution expansions-wavelet transforms in one dimension-The fast wavelet transform-wavelet transforms in two dimensions-image compression-fundamentals- some basic compression methods.

**UNIT V:** Image Segmentation: Fundamentals-Point, Line and Edge Detection-Thresholding –Region-Based segmentation-segmentation using morphological watersheds.

#### **BOOKS FOR REFERENCES.**

1. Rafael C. Gonzalez ,Richard E. Woods, Digital Image Processing , Pearson Prentice Hall, Third Edition,2013.
2. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, Digital Image Processing Using MATLAB, McGraw Hill Education (India) Private Limited., 2014.
3. Chanda.B., Dutta Majumder .D., Digital Image Processing and Analysis, Prentice Hall of India, New Delhi, 2007.
4. Scott E.Umbaug, Computer Vision and Image Processing, Prentice Hall International, New Delhi, 1998.

## PAPER-III

### 3. NATURAL LANGUAGE PROCESSING

**ELECTIVE PAPER: III**

**CREDITS: 5**

**COURSE CODE: 18M16/NLP**

- UNIT I Natural Language Processing: Natural Language Processing NLP-Introduction, Words-Regular Expressions and Automata, Morphology, FSTs, Spellcheckers, Minimum Edit distance, Hidden Markov and Maximum Entropy Models, Syntax – WordClasses and Part-of- Speech Tagging, Semantics-Semantics Analysis, Word Sense Disambiguation and Information Retrieval.
- UNIT II Paninian Grammar: Paninian grammar - Semantic model - Free word order and Vibhakti-Paninian theory - Karaka relations - Active Passive - Control - Karaka to Vibhakti mapping - Karaka Sharing.
- UNIT III Machine Translation: Machine Translation (MT) – Survey – Possible approaches – Current status – Anusaraka or Language accessor – Cutting the Gordian knot – Structure of Anusaraka Systems – User Interface – Linguistic area – Anusaraka Output – Language bridges.
- UNIT IV Formalisms: Lexical Functional Grammar (LFG) – Active, Passive and Dative Constructions – WH movements in questions – LFG Formalism – Well – formedness conditions – Handling WH movements in questions – Computational Aspects – Features and Feature structures – Unification – other constraints – CFG and Indian languages – Functional Specification – Lexicalized Grammars and Locality – Lexicalized Tree Substitution Grammar – Lexicalized Tree Adjoining Grammar – Feature Structures – Mathematical Aspects.
- UNIT V GB Theory: Comparing TAG with PG – Similarities between TAG and PG – Differences between TAG and PG – Government and Binding Theory – GB Modules – X-bar Theory – Theta theory – Government-Case Theory – Bounding Theory – Empty Category Principle (ECP) – Binding Theory – Constraints on Movement – GB Parsing – Comparing GB with PG.

#### BOOK FOR REFERENCES:

1. Daniel Jurafsky and James H.Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, 2<sup>nd</sup> Edition, Prentice Hall, 2008.
2. Akshar Bharti, Vineet Chaitanya, Rajiv Sangal, “Natural Language Processing – A Paninian Perspective”, Prentice Hall of India, 2000.
3. James Allen, Natural Language Understanding, 3<sup>rd</sup> Edition, Pearson Education, 2005.

## **PAPER-III**

### **4. CLOUD COMPUTING**

**ELECTIVE PAPER: IV**

**CREDITS: 5**

**COURSE CODE: 18M16/CCG**

- UNIT I Introduction: Cloud Computing – Overview – Applications-Intranets and the Cloud – Companies in the Cloud Today- Cloud Computing Services- On Demand Computing – Discovering Cloud Services-Development Services and Tools.
- UNIT II Hardware and Infrastructure: Cloud hardware and infrastructure-clients-security-network-services-Accessing cloud -cloud storage-Cloud standards.
- UNIT III Cloud Services: Types of Cloud Services: Software as a Service - Platform as a Service - Infrastructure as a Service - Monitoring as a Service - Communication as a Services – Building Cloud Network – Virtualization.
- UNIT IV Cloud Types: Public cloud – Private Cloud – Hybrid cloud – Enterprise Cloud – Comparisons
- UNIT V Governance and Case Studies: Organizational Readiness and Change Management in Cloud – Data Security in Cloud – Legal issues in Cloud Computing – Production Readiness for cloud services

#### **BOOKS FOR REFERENCES:**

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, “Cloud Computing –A Practical Approach”, Tata McGraw Hill Education Pvt. Ltd, 2013.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “ Cloud Computing – Principles and Paradigms” , Wiley Publications, 2014.
3. Michael Miller, “ Cloud Computing – Web-Based Applications that change the way you work and Collaborate Online” , Pearson Education, 2013.
4. John W. Rittinghouse, James F. Ransome , “Cloud Computing – Implementation , Management and Security”, CRC Press, 2013.



## **PAPER-III**

### **5. CRYPTOGRAPHY AND NETWORK SECURITY**

**ELECTIVE PAPER: V**

**CREDITS: 5**

**COURSE CODE: 18M16/CNS**

UNIT I : Introduction : Symmetric Ciphers: Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard. 12 Hrs

UNIT II : AES : Transformation Functions – Key Expansions - Block Cipher Operation – Multiple Encryption and Triple DES – ECB – CBC – CFM – OFM – Counter Mode. 12 Hrs

UNIT III : Public Key Encryption: Principles of Public Key Cryptosystems - RSA Algorithm - Diffie-Hellman Key Exchange. 12 Hrs

UNIT IV : MAC: Functions – Authentication codes – HMAC – Key Management and Distribution – Distribution of Public keys – X.509 Authentication Service – User Authentication – Kerberos – Federated Identity Management – Personal Identity Verification 12Hrs

UNIT V : Electronic Mail Security: PGP – S/MIME - IP Security – Overview – IP Security Policy – Encapsulating Security Payload. 12 Hrs

#### **BOOKS FOR REFERENCES:**

1. William Stallings, “Cryptography And Network Security – Principles and Practices”, Pearson, Sixth Edition, 2015.
2. AtulKahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2013.
3. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2011.
4. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, Pearson Education, 2013.

## PAPER-III

### 6. ARTIFICIAL NEURAL NETWORKS

**ELECTIVE PAPER: VI**

**CREDITS: 5**

**COURSE CODE: 18M16/ANN**

- UNIT I Introduction to Pattern Recognition, Bayesian decision theory: Classifiers, Discriminant functions, Decision surfaces, Normal density and Discriminant functions, discrete features.
- UNIT II Maximum Likelihood and Bayesian Estimation: Parameter estimation methods, Maximum- Likelihood estimation, Bayesian estimation, Bayesian Parameter Estimation, Gaussian Case, General Theory, Problem of Dimensionality, Accuracy, Dimension, and Training Sample Size, Computational Complexity and Overfitting, Component Analysis and Discriminants, Principal Component Analysis (PCA), Expectation Maximization (EM), Hidden Markov models for sequential pattern classification, First-Order Markov Models, First-Order Hidden Markov Models, Hidden Markov Model Computation, Evaluation, Decoding and Learning.
- UNIT III Nonparametric :Density estimation, Parzen-window method, Probabilistic Neural Networks (PNNs), K-Nearest Neighbor , Estimation and rules, Nearest Neighbour and Fuzzy Classification. Linear Discriminant function based classifiers: Perceptron, Linear Programming Algorithm, Support Vector Machines (SVM).
- UNIT IV Multilayer Neural Network: Feed Forward Classification, Back Propagation Algorithm, Error Surface Stochastic Data: Stochastic search, Boltzmann Learning, Evolutionary method and Genetic Programming.
- UNIT V Nonmetric methods for pattern classification: Decision trees, Classification and Regression Trees (CART) and other tree methods, String recognition and Rule Based method. Unsupervised learning and clustering : Mixture Densities and Identifiability, Maximum Likelihood estimation, Application Normal Mixture, Unsupervised Bayesian Learning, Data Description and Clustering, Hierarchical Clustering, Graph theory method, Problem of validity, Component analysis.

#### **BOOK FOR REFERENCES:**

1. R.O.Duda, P.E.Hart and D.G.Stork, "Pattern Classification 2nd Edition", John Wiley, 2007
2. Christopher M. Bishop, "Neural Network for Pattern Recognition", Oxford Ohio Press.
3. E. Gose, R. Johansonbargh, "Pattern Recognition and Image Analysis", PHI
4. Ethen Alpaydin, "Introduction to Machine Learning", PHI
5. Satish Kumar, "Neural Network- A Classroom Approach", McGraw Hill.
6. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press