ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

Chennai-600 008

Syllabus

(Offered from the academic year 2021-2022)

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)

OBJECTIVES OF THE MASTER OF PHILOSOPHY PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: Professional Upgradation
Scholars will have successful academic career growth by providing the scholars theoretical, technical and research aspects that enable them to grow into competent.

PEO 2: Research & innovation
Scholars will have the cognitive ability to contribute original scientific contributions that have both practical significance and elegant theoretical grounding that focuses on the various areas of Computer Science and IT

PEO 3: Managerial Skills
Scholars are motivated to impart strong knowledge in presenting and publishing research contributions belonging to the domain of Computer Science and Applications.

PEO 4: Communication Efficacy: To motivate the scholars to draft the research oriented documentations with policies and ethics to abide by.

1. ELIGIBILITY FOR ADMISSION

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 1st 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.

PAPERS - PART I:

PAPER I	**:**	**Research Methodology** (Research Methods)
PAPER II	**:**	**Advanced Technologies in Computer Science**
PAPER III	**:**	**Research Specialization Paper** (Pertaining to the area of specialization chosen by the candidate and / or research Supervisor's specialization)

DISSERTATION - 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 the 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.

PROGRAMME OUTCOMES (PO)

The research scholars are able to:

PO1: **Computational Knowledge:** Apply the knowledge of mathematics, science, and technology to the solution of complex scientific problems.

PO2: **Design and Development:** Design solutions for complex problems and design system components with appropriate consideration for the society.

PO3: **Modern Tools Usage:** Create / Select the appropriate recent research trend tools to demonstrate or to simulate the technical test beds for the better clarity to reach out the further move towards academic excellence.

PO4: Communication: Communicate effectively on ICT activities with the academic community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive instructions with at most clarity.

PO5:Life-long learning: Recognize the need for lifelong learning and the ability to engage and accommodate the technological changes.

PO6: Creativity and Entrepreneurship: Understand the impact and the significance of research that perceives societal and environmental, sustainable development.

PO7: Social Responsibility: Apply ethical principles associated with research and commit to professional growth and responsibilities and norms of the scientific practice.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After completing the course, the research scholars will be able to,

PSO1: Analyze the impact of new emerging areas of computer science in the global, economic, environmental and societal context.

PSO2: Acquire in-depth knowledge in the process of developing new ideas as well as gain expertise in the defined areas of research in computer science.

PSO3: Develop innovative methodologies to challenging issues identified and contributing to the development of technological knowledge and intellectual property.

PSO4: Ability to apply mathematical knowledge to solve complex task, model real world problems using appropriate innovative technologies.

PSO5: Facilitate knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

6. EVALUATION

(i) PART – I: CORE and SPECIALIZATION

There shall be **two** Continuous Internal Assessment (CIA) tests of two hours duration and **one** External examination of three hours duration for the core courses. 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; Max. Marks: 100.

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

CIA Marks	**:**	50 Marks
End Semester Marks	**:**	150 Marks
Total Marks	**:**	200 Marks

7. QUESTION PAPER PATTERN:

KNOWLEDGE LEVEL (as per the revised Bloom's Taxonomy levels)	**MAXIMUM MARKS - 100**
K3, K4 (Applying & Analyzing)	**PART –A (5 X 8 = 40 Marks)** Answer **ALL Questions** **(**Each question carries **8 Marks**) 1. a Question from Unit I (Or) b. Question from Unit I 2. a. Question from Unit II (Or) b. Question from Unit II 3. a. Question from Unit III (Or) b. Question from Unit III 4. a. Question from Unit IV (Or) b. Question from Unit IV 5. a. Question from Unit V (Or) b. Question from Unit V
K5, K6 (Evaluating & Creating)	**PART - B (3X20=60 marks)** Answer any **THREE** questions out of **FIVE** questions (Each question carries **20 Marks**) 6. Question from Unit I 7. Question from Unit II 8. Question from Unit III 9. Question from Unit IV 10. Question from Unit V

8. COURSE PROFILE

(i) PART – I: CORE & SPECIALIZATION

COURSE	PAPER CODE	PAPER TITLE	Hrs /Week	CREDITS	CA MARKS	END - SEM MARKS	TOTAL
PART I	18M21/RMY	Research Methodology	**6**	**5**	**40**	**60**	**100**
	18M21/ATC	Advanced Technologies in Computer Science	**6**	**5**	**40**	**60**	**100**
	18M21/DWM	1. Data Warehousing and Mining	**6**	**5**		**100**	**100**
	18M21/DIP	2. Digital Image Processing					
	18M21/CCG	3. Cloud Computing					
	18M21/CNS	4. Cryptography and Network Security					
	18M21/ANN	5. Artificial Neural Networks					
PART II	18M21/DIS	Dissertation	**-**	**21**	**50**	**150**	**200**
			TOTAL CREDITS:	**36**			

CREDITS DISTRIBUTION

S.NO	TITLE OF THE PAPER	CORE/ SPECIALIZATION	CREDITS
1	**PAPER-I:** Research Methodology	**CORE**	**5**
2	**PAPER-II:** Advanced Technologies in Computer science	**CORE**	**5**
3	**PAPER-III:** 1. Data Warehousing and Mining 2. Digital Image Processing 3. Cloud Computing 4. Cryptography and Network Security 5. Artificial Neural Networks	**SPECIALIZATION**	**5**
4	**DISSERTATION**	**SPECIALIZATION**	**21**
		TOTAL CREDITS	**36**

M. Phil., Computer Science (2021-22 onwards)

S.NO	CORE/ SPECIALIZATION	TITLE OF THE PAPER	PAPER CODE
1	**CORE**	**PAPER-I:** Research Methodology	18M21/RMY
2	**CORE**	**PAPER-II:** Advanced Technologies in Computer science	18M21/ATC
3	**SPECIALIZATION**	**PAPER-III:** 1. Data Warehousing and Mining	18M21/DWM
		2. Digital Image Processing	18M21/DIP
		3. Cloud Computing	18M21/CCG
		4. Cryptography and Network Security	18M21/CNS
		5. Artificial Neural Networks	18M21/ANN
4	**SPECIALIZATION**	**DISSERTATION**	18M21/DIS

(ii) DISSERTATION AND VIVA-VOCE:

Continuous Assessment (Internal Guide)		**Marks**
Reviews & Dissertation work	:	40 marks
Oral Presentation	:	10 marks
TOTAL	:	50 marks

External Assessment		**Marks**
Choice of Subject & Review of Literature	:	10 marks
National , International Conference / Journal Communicated / Presented	:	20 marks
Organization & Interpretation	:	20 marks
Project Presentation	:	20 marks
Final Report	:	30 marks
Viva-Voce	:	50 marks
TOTAL	:	150 marks

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. CLOUD COMPUTING

4. CRYPTOGRAPHY AND NETWORK SECURITY

5. ARTIFICIAL NEURAL NETWORKS

PAPER I
RESEARCH METHODOLOGY

COURSE CODE: 18M21/RMY **CREDITS:5**

COURSE OBJECTIVES:

To enable the research scholars to,

1. Find the sources of research problem for further exploration.
2. Investigate the sampling design and Scaling techniques.
3. Check for the methods for data collection and analysis.
4. Know the importance of Experimenting and generating reports.
5. Present the conceptual view of the domain of their interest.

COURSE OUTLINE:

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 V: CASE STUDY: Presentation by students on their area of research.

RECOMMENDED TEXTBOOKS:

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.

REFERENCE BOOKS:

1. Richard A. Johnson, "Miller and Freund's Probability and Statistics for Engineers", 8th Edition, Pearson Education, Asia, 2011.

JOURNALS:

1. https://www.journals.elsevier.com/network-security
2. https://ieeexplore.ieee.org/document/4646371

E-LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106105031/
2. https://wanguolin.github.io/assets/cryptography_and_network_security.pdf
3. https://www.academia.edu/38969883/Full_Book_Cryptography_And_Network_Security_Principles_And_Practice_7th_Edition_PDF_WP
4. https://www.pearson.com/us/higher-education/program/Stallings-Cryptography-and-Network-Security-Principles-and-Practice-7th-Edition/PGM334401.html

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Identify the research problem by analyzing its characteristics
CO 2	Analyze the sampling and scaling techniques
CO 3	Demonstrate the data collection methods to analyze the same
CO 4	Explore the tools of research for enhanced experimental analysis
CO 5	Check for the expertise over the domain which is opted

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	2	2	3	3	2
CO 4	2	3	3	3	3
CO 5	3	2	2	2	2
Average	**2.6**	**2.6**	**2.8**	**2.8**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN

End Semester Examination

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER II
ADVANCED TECHNOLOGIES IN COMPUTER SCIENCE

COURSE CODE: 18M21/ATC **CREDITS: 5**

COURSE OBJECTIVES:

To enable the research scholars to

1. Conceptualize and summarize the big data, trivial data versus big data, big data computing technologies and Hadoop architecture.
2. Provide an overview of Wireless Communication networks area and its applications in communication engineering, the contribution of Wireless Communication networks to overall technological growth, different methodologies used in Wireless Communication Networks.
3. Identify the technical foundations of cloud systems architectures, Cloud services and Analyze the problems and solutions to cloud application problems.
4. Explore about various genetic algorithms and different optimization algorithms
5. To gain knowledge about the emerging trends s neural networks, Machine learning algorithms And deep neural networks.

COURSE OUTLINE:

UNIT I: Big Data Systems: Big Data Characteristics, Types of Big Data Architecture, Introduction to Map-Reduce and Hadoop; **Distributed File System, HDFS. NOSQL:** NOSQL and Query Optimization; Different NOSQL Products, Querying and Managing NOSQL; Indexing and Ordering Data Sets; NOSQL in Cloud.

UNIT II: Mobile Technology: GSM and CDMA; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol; Communication Satellites, Wireless Networks and Topologies; Cellular Topology, Mobile Adhoc Networks, Wireless Transmission and Wireless LANs; Wireless Geolocation Systems, GPRS and SMS.

UNIT III: Cloud Computing and IoT: Saas, Paas, Iaas, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement, Basics of IoT.

UNIT IV: Genetic Algorithms (GA): Encoding Strategies, Generic Operators, Fitness Functions and GA Cycle; Problem Solving using GA.

UNIT V: Machine Learning and Neural Networks: Introduction to Machine Learning, Comparison of Traditional and Machine learning Algorithms, Applications of Machine learning, Introduction to Learning Rules (Supervised, Unsupervised, Reinforcement Learning). Introduction to Biological Neural Network, Comparison of ANN with Biological Neural Network, Neuron Model and Architecture: Single-Input Neuron, Transfer functions, Multiple-input Neuron, A Layer

of Applications of Artificial Neural Networks, Deep Learning – CNN – Architectures of CNN-research trends in deep learning

RECOMMENDED TEXTBOOKS:

UNIT - I

1. Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.

UNIT - II

1. Mobile Communication, Jochen Schiller, Second Edition.

UNIT - III

1. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud (Make: Projects) by Cuno Pfister,1st Edition, 2011
2. Cloud Computing: Principles and Paradigms,,Rajkumar Buyya (Editor), James Broberg (Editor), Andrzej M. Goscinski (Editor), 2011

UNIT - IV

1. Introduction to Genetic Algorithms,Authors: Sivanandam, S.N., Deepa, S. N.,2008
2. An Introduction to Genetic Algorithms,By **Melanie Mitchell**

UNIT – V

1. Principles of Artificial Neural Networks. Daniel Graupe, 3rd Edition. 2014
2. Fundamental of Neural Networks Architectures, Algorithms and Application., Laurene Fausett, Pearson India. 2012
3. Saikat Dutt , Subramanian Chandramouli , Amit Kumar Das, Machine Learning , First Edition , Pearson India Services Pvt. Ltd , 2019. (Unit 1, 2, 3)

JOURNALS:

1. https://www.sciencedirect.com/journal/journal-of-genetic-engineering-and-biotechnology.
2. https://jgeb.springeropen.com/
3. www.inderscience.com/jhome.php?jcode=ijaisc
4. http://jaiscr.eu/
5. https://www.inderscience.com

E-LEARNING RESOURCES:

1. NPTEL :: Computer Science and Engineering - NOC:Cloud computing

COURSE OUTCOMES:

CO No.	CO Statement
CO 1	Identify big data architecture, map-reduce operations in Hadoop and about distributed file system
CO 2	Identify various GSM, CDMA architecture, mobile and wireless technologies
CO 3	To **know about** Saas, Paas, Iaas, Public and Private Cloud; Virtualization, Virtual Server, cloud storage and fundamentals of IOT
CO 4	**Identify various Genetic Algorithms (GA),** Encoding Strategies, Generic Operators and Fitness Problem Solving using GA
CO 5	**To Know about Artificial Neural Networks (ANN),** Supervised and Reinforcement Learning and various algorithms

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	3	3	3
CO 3	2	2	3	3	2
CO 4	2	3	3	3	3
CO 5	3	2	2	2	2
Average	**2.6**	**2.6**	**2.8**	**2.8**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN

End Semester Examination

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER-III

1. DATA WAREHOUSING AND MINING

ELECTIVE PAPER: I **CREDITS: 5**

COURSE CODE: 18M21/DWM

COURSE OBJECTIVES:

To enable the research scholars to

1. Understand the basics of data mining, the technologies used , various types of data and about data visualization tools related to research
2. Know about various preprocessing techniques about data cleaning, data transformation and data generalization. The students gain indepth knowledge into various analytical Processing tools , data warehouse architecture and multidimensional data models
3. Explore the fundamentals of data cube technology, multidimensional data models – snowflake schema, fact cancellation and frequent item set mining and various evaluation methods like association rule mining and apriori analysis
4. Analyze various classification methods like decision tree induction, bayes, rule based classification, support vector machines, bayes classification etc.,
5. Know about various cluster analysis methods, outlier detection and recent research trends in data mining

COURSE OUTLINE:

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 Item set 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.

RECOMMENDED TEXTBOOKS:

1 J. Han, M. Kamber, "Data Mining: Concepts and Techniques", Morgan Kauffman, 2011.
2 Margaret H.Dunham, "Data Mining: Introductory and Advanced Topics", PearsonEducation 2004
3 Sam Anahory, Dennis Murry, "Data Warehousing in the real world", Pearson Education 2003
4 David Hand, Heikki Manila, PadhraicSymth, "Principles of Data Mining", PHI 2004
5 Alex Bezon, Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", McGraw-Hill Edition, 2001.

REFERENCE BOOKS:

1 Charu C. Aggarwal, "Data Mining: The Textbook" , Springer 2015 Edition
2 **Da Ruan**, "Intelligent Data Mining: Techniques and Applications " Springer 2007
3 Mohammed J. Zaki, Wagner Meira, Jr, Wagner Meira, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press
4 Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal ,"Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann, Fourth Edition 2017
5 Arun K. Pujari, "Data Mining Techniques", Universities Press, 2005

JOURNALS:

1 https://link.springer.com/journal/10618
2 https://www.inderscience.com/jhome.php?jcode=ijdmmm
3 http://www.sciencepublishinggroup.com/journal/index?journalid=603
4 https://tist.acm.org/
5 https://www.scimagojr.com/journalsearch.php?q=19700190323&tip=sid

E-LEARNING RESOURCES:

1 https://www.classcentral.com/course/coursera-pattern-discovery-in-data-mining-2733
2 https://www.classcentral.com/subject/data-mining
3 https://web.ccsu.edu/datamining/resources.html?redirected
4 http://whitepapers.virtualprivatelibrary.net/Data%20Mining%20Resources.pdf
5 https://www.guru99.com/data-mining-tutorial.html

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Ability to apply acquired knowledge in understanding data, nature of data and select suitable methods for data analysis and various data mining principles
CO 2	The importance of data preprocessing, Design data warehouse with dimensional modeling and apply OLAP operations.
CO 3	Design and deploy appropriate classification techniques for high dimensional data for better organization of the data
CO 4	Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
CO 5	Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	1	1
CO 2	2	3	3	1	1
CO 3	2	3	2	2	2
CO 4	2	3	3	3	2
CO 5	1	2	2	3	3
Average	2	2.6	2.4	2	1.8

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of Logic Gates, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

End Semester Examination

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER-III
2. DIGITAL IMAGE PROCESSING

ELECTIVE PAPER: II **CREDITS: 5**

COURSE CODE: 18M21/DIP

COURSE OBJECTIVES:

To enable the research scholars to

1. Understand the need for image transforms different types of image transforms and their properties.
2. Learn different techniques employed for the enhancement of images.
3. Learn different causes for image degradation and overview of image restoration techniques.
4. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.
5. Learn different feature extraction techniques for image analysis and recognition

COURSE OUTCOMES:

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 IMAGE FILTERING**: Intensity Transformation functions – Histogram processing – Fundamentals of Spatial filtering-smoothing spatial filters.

UNIT III **GEOMETRIC TRANSFORMTIONS 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-Thres holding –Region-Based segmentation-segmentation using morphological watersheds.

RECOMMENDED TEXTBOOKS:

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.

REFERENCE BOOKS:

1. A. K. Jain, "Fundamentals of Digital Image processing", Prentice Hall of India, New Delhi, 2nd Edition, 1997.
2. Rafael C. Gonzalez, "Digital Image processing using MATLAB", Richard E. Woods and Steven Low price Edition, Pearson Education Asia, India, 2nd Edition, 2004.
3. William K. Pratt, "Digital Image Processing", John Wiley & Sons, New Delhi, India, 3rd edition, 2004.
3. Arthur R. Weeks, Jr, "Fundamentals of Electronic Image Processing", SPIE Optical Engineering Press, New Delhi, India, 2nd Edition, 1996.

JOURNALS:

1. https://link.springer.com/journal/10278
2. www.ciitresearch.org/dip.html
3. https://sites.google.com/site/ijcsis/digital-image-processing

E-LEARNING RESOURCES:

1. https://www.coursera.org/learn/digital
2. https://ufonline.ufl.edu/courses/gis4037-digital-image-processing/
3. http://www.eucourses.eu/en/courses-available/digital-extra
4. https://www.online.colostate.edu/courses/ECE/ECE513.dot
5. https://alison.com/tag/digital-image-editing

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	To analyze the image fundamentals and mathematical transforms necessary for image processing
CO 2	To study the image enhancement , image segmentation and image restoration techniques
CO 3	To be familiar with image compression procedures
CO 4	To understand Image representation and will be able to experiment with color coordinates of images.
CO 5	To be familiar with different segmentation techniques

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	2	3
CO 2	3	3	3	3	2
CO 3	2	3	2	3	3
CO 4	3	3	3	2	3
CO 5	3	2	3	2	2
Average	**2.8**	**2.8**	**2.6**	**2.4**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER III
CLOUD COMPUTING

COURSE CODE: 18M21/CCG **CREDITS:5**

COURSE OBJECTIVES:

To enable the research scholars to,

1. Provides a comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.
2. Affords introduction and research to the state-of-the-art in Cloud Computing fundamental issues, Research technologies, applications and implementations

COURSE OUTLINE:

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.

RECOMMENDED TEXTBOOKS:

1. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing –A Practical Approach", Tata McGraw Hill Education Pvt. Ltd, 2018.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, " Cloud Computing – Principles and Paradigms" , Wiley Publications, 2017.

REFERENCE BOOKS:

2. Michael Miller, " Cloud Computing – Web-Based Appplications that change the way you work and Collaborate Online" , Pearson Education, 2016.
3. John W. Rittinghouse, James F. Ransome , "Cloud Computing – Implementation , Management and Security", CRC Press, 2016.

JOURNALS:

1. https://journalofcloudcomputing.springeropen.com/
2. https://www.inderscience.com/jhome.php?jcode=ijcc
3. https://link.springer.com/journal/13677
4. http://www.imanagerpublications.com/journalsfulldetails/23/JournalonCloudComputing

E-LEARNING RESOURCES:

1.https://nptel.ac.in/courses/106105167/
2.https://www.udemy.com/topic/virtualization/
3.https://www.edx.org/school/aws
4.https://aws.amazon.com/types-of-cloud-computing/
5.https://www.esds.co.in/blog/cloud-computing-types-cloud/#sthash.NdcMd32C.dpbs

COURSE OUTCOMES:

CO No.	CO Statement
CO 1	Demonstrate the different taxonomy of parallel and distributed computing
CO 2	Articulate the main concepts, key technologies, strengths and limitations of Virtualization and Cloud computing
CO 3	Compare and contrast the delivery and deployment models of cloud computing
CO 4	Analyze the core issues of cloud computing such as energy efficiency, security, privacy and interoperability
CO 5	Recognize the cloud file systems and their applications in industry. Identify problems, explain, analyze, and evaluate various cloud computing solutions

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	2	2	3	2	2
CO 4	2	3	3	3	3
CO 5	3	3	2	3	3
Average	**2.6**	**2.8**	**2.6**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER III
CRYPTOGRAPHY AND NETWORK SECURITY

COURSE CODE: 18M21/CNS **CREDITS: 5**

COURSE OBJECTIVES:

To enable the research scholars to,

1. Analyze the underlying logic behind symmetric ciphers.
2. Incorporate the transformation functions.
3. Depict the functionality of public key encryption.
4. Investigate the functions associated with MAC.
5. Understand the security features wrapped with electronic mail.

COURSE OUTLINE:

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

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

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

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.

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

RECOMMENDED TEXTBOOKS:

1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson, Sixth Edition, 2016.
2. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2015.

REFERENCE BOOKS:

1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2016.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2016.

JOURNALS:

1. https://www.journals.elsevier.com/network-security
2. https://ieeexplore.ieee.org/document/4646371

E-LEARNING RESOURCES:

1 https://nptel.ac.in/courses/106105031/
2 https://wanguolin.github.io/assets/cryptography_and_network_security.pdf
3 https://www.academia.edu/38969883/Full_Book_Cryptography_And_Network_Security_Principles_And_Practice_7th_Edition_PDF_WP
4 https://www.pearson.com/us/higher-education/program/Stallings-Cryptography-and-Network-Security-Principles-and-Practice-7th-Edition/PGM334401.html

COURSE OUTCOMES:

CO No.	CO Statement
CO 1	Explore the encryption techniques through symmetric cipher.
CO 2	Obtain thorough knowledge over advanced encryption standard.
CO 3	Compare the logic behind RSA and Diffie Hellman algorithms
CO 4	Understand the conceptual knowledge of authentication and Identity verification.
CO 5	Investigate the security measures coupled with protocols.

Mapping of CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	3	2	3	2	2
CO 4	2	3	3	3	3
CO 5	3	3	2	3	2
Average	**2.8**	**2.8**	**2.6**	**2.8**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	

PAPER III
ARTIFICIAL NEURAL NETWORKS

COURSE CODE: 18M21/ANN **CREDITS: 5**

COURSE OBJECTIVES:

To enable the research scholars to,

1. To Provide knowledge on fuzzy logic neural network to principles
2. To understand models of ANN
3. To use the fuzzy logic and neural network for application for pattern classification
4. To Apply genetic algorithm to various layers of the network
5. To familiar with various unsupervised algorithms

COURSE OUTLINE:

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.

RECOMMENDED TEXTBOOKS:

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.

REFERENCE BOOKS:

1. E. Gose, R. Johansonbargh, "Pattern Recognition and Image Analysis", PHI
2. Ethen Alpaydin, "Introduction to Machine Learning", PHI
3. Satish Kumar,"Neural Network- A Classroom Approach", McGraw Hill.
4. S.Theodoridis and K.Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press
5. C.M.Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

JOURNALS:

1.https://www.inderscience.com/jhome.php?jcode=ijaisc
2.http://jaiscr.eu/

E-LEARNING RESOURCES:

1 http://www-scf.usc.edu/~csci567/
2 https://www.comp.nus.edu.sg/~cs4243/lecture/tsim-prec.pdf
3 http://www.public.asu.edu/~bli24/CSE591.html
4 http://people.idsia.ch/~foerster/patternclassification.html
5 https://cse.buffalo.edu/~jcorso/t/2010S_555/

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Develop the skill in basic understanding on fuzzy and neural network
CO 2	Explore the functional components of neural classification and the functional components of various classification models.
CO 3	Develop and implement a basic trainable neural network set for pattern classification
CO 4	Applying genetic algorithm to various layers of the network
CO 5	Familiar with various unsupervised algorithms.

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	3	3	3
CO 2	3	3	2	3	3
CO 3	2	3	3	2	3
CO 4	3	3	3	3	3
CO 5	3	2	3	3	3
Average	2.8	2.6	2.8	2.8	3

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN:

End Semester Examination

Knowledge Level	Section	Word Limit	Marks	Total
K3, K4 (APPLYING & ANALYZING)	A – 5 x 8 Marks Q.No.1 to 5(Internal Choice)	300	40	100
K5, K6 (EVALUATING & CREATING)	B – 3 x 20 Marks 3 Question out of 5 (open choice) Q.No. 6 to 10	500	60	