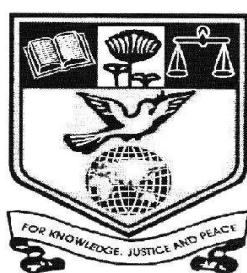


**CURRICULUM FRAMEWORK AND SYLLABUS FOR
MASTER OF PHILOSOPHY (M.PHIL) IN COMPUTER SCIENCE**

For the students admitted from the Academic Year 2019-2020 onwards
BASED ON CHOICE BASED CREDIT SYSTEM (CBCS) AND OUTCOME BASED EDUCATION (OBE)



2019-2020

Submitted to Academic Council



POST GRADUATE AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

NEHRU MEMORIAL COLLEGE

[Nationally Accredited with 'A' Grade by NAAC]

An Autonomous College affiliated to Bharathidasan University

Puthanampatti—621 007

[Board of Studies meeting was held on 21.09.2018 and approved by academic
council on 10.04.2019]

M.Phil Computer Science

VISION

Provide quality research in Computer Science and to be recognized as an international research programme

MISSION

To excel in research and innovation that discovers new knowledge and enables to develop new methodologies and models

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

The scholars of M.Phil Computer Science programme will be able to

PEO1: understand the principles and methodologies of research

PEO2: identify the critical and relevant research problems in Computer Science

PEO3: undertake the research for professional carriers to meet the needs of the society

PEO4: apply the acquired knowledge for implementation of their research

PEO5: motivate and inspire the students to pursue their doctoral programmes

PROGRAMME OUTCOME (PO)

PO1: Scientific Knowledge

Apply the knowledge, methods and techniques to solve real world research problems

PO2: Problem Analysis

Analyze the research problems and interpret the data relevant to the research

PO3: Design and Development of Solution

Design the appropriate methods or techniques to solve the research problems

PO4: Conduct investigations of complex problems

Ability to design algorithms using research based knowledge and methods

PO5: Modern tool usage

Develop a model and implement the methodology using the available research tools

PO6: Life long learning

Extend life long learning in the field of research in order to undertake and solve the various challenging research problems

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO1: Understand the concepts, techniques and methods of research methodology

PSO2: Apply the techniques and algorithms to develop solutions to research problems

PSO3: Design techniques or methods to solve the complex problems in the field of research

PSO4: Implement and test the solutions developed for the research problems

Programme Structure

a. Programme Duration:

Full Time: One year

Part Time: Two years

b. System followed: Semester

c. Medium of Instruction: English

d. Credit System:

Total number of credits: 24

e. Eligibility criteria for admission to the programme:

M.Sc. Computer Science

Master of Computer Application

M.Sc. Information Technology

M.Phil - Internal and External Assessment

Internal Assessment – 25 Marks

CIA Test (Mid and End Semester)	-	10 Marks
CIA Test I – for first two and half units		
CIA Test II – for remaining two and half units		
Attendance	-	05 Marks
Seminar	-	05 Marks
Assignment	-	05 Marks
Total	-	25 Marks

External Assessment – 75 Marks

Question Paper Pattern for CIA Test and External Assessment:

Section A: 10 Questions x 2 Marks = 20 Marks

(Two Questions from each unit)

Section B: 5 Questions x 5 Marks = 25 Marks

(Internal Choice and one question from each unit)

Section C: 3 Questions x 10 Marks = 30 Marks

(Answer any three out of 5 questions and one question from each unit)

POST GRADUATE AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

M.Phil PROGRAMME IN COMPUTER SCIENCE [CBCS]

[For the candidates admitted from 2019-2020]

Sem	Course	Title	Credit	Marks		Tot
				CIA	SE	
I	Core Course I	Research Methodology	4	25	75	100
	Core Course II	Advanced Topics in Computer Science	4	25	75	100
	Core Course III	Teaching and Learning Skills	4	25	75	100
	Core Course IV	Paper on Topic of Research	4	25	75	100
II		Dissertation & Viva Voce (150 + 50)	8	-	200	200
		Total	24			600

Core Course IV - Paper on Topic of Research

- a. Big Data Technology and Analytics
- b. Wireless Communication and Networks
- c. Cloud Computing
- d. Web Mining
- e. Data Mining and Warehousing
- f. Cryptography and Network Security
- g. Machine Learning
- h. Social Network Analytics

Course Code & Title	CC-I Research Methodology	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • classify and analyze various types of algorithms • learn the various probability distributions and statistical tests • study the mathematical logics and optimization algorithms • know thesis writing • prepare research articles for journal publications 	

Unit-I Analysis of Algorithm

Algorithm specification – Performance Analysis – Randomized Algorithm –General Methods - Divide and Conquer method – Greedy method – Dynamic Programming -Basic Traversal and Search Techniques –Backtracking –Branch and Bound –NP hard and NP Complete problems.

Unit-II Probability and Analysis of Experiments

Introduction to Probability –Probability Distribution: Binomial –Poisson –Uniform – Exponential and Normal –Analysis of Variance (ANOVA) – Nonparametric Tests: One Sample Test -Two Sample Test - Basic Multivariate Analysis: Correlation Analysis.

Unit-III Mathematical Logic

Propositions - evaluation - precedence rules -tautologies - reasoning using equivalence transformation - laws of equivalence - substitution rules - a natural deduction system. Deductive proofs - inference rules - proofs - sub proofs- The predicate calculus – statement functions, variables , quantifiers, Predicate formulae – Theory of Inference – Formulae involving more than one quantifier.

Unit-IV Evolutionary Optimization Algorithms

Genetic Algorithm-Mathematical Models of Genetic Algorithm-Genetic Programming-Evolutionary Programming-Simulated Annealing-Ant Colony Optimization-Particle Swarm Optimization- Biogeography based Optimization.

Unit-V Thesis Writing

Introduction to Research – Defining the research problem – Research Ethics - Research Design – Planning the Thesis – Writing Journal Articles – Publication of papers - Writing the Thesis – Referencing.

Books for Study:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekaran, “ Computer Algorithms/C++”, Second Edition, Universities Press(India) Private Ltd,2008,ISBN-10: 092930642,ISBN-13: 978-0929306421
2. R.Pannerselvam, “Research Methodology”, Prentice Hall of India , second Edition, New Delhi,2013, ISBN-30:978-812034 -9469
3. David Gries, "The Science of Programming", Narosa Publishing House, New Delhi, 1993,ISBN-10: 038790641X,ISBN-13: 978-0387906416
4. Dan Simon, “Evolutionary Optimization Algorithms”, Wiley, Black wheel ,2013,ISBN-B:978-0470-937419.
5. Jonathan Anderson, Millicent.Poole, “Assignment & Thesis Writing “, 4th Edition ,Wiley India Pvt Ltd.,2011, ISBN-30:978-81265-3075.

Books for Reference:

1. Nikalaus Wirth , “Algorithms and Data Structures”, Mc Graw–Hill International Edition, 1985.
2. Kothari C.R , “Research Methodology – Methods and Techniques”, New Age International, New Delhi, 2011.
3. R.Ganesan, “Research Methodology for Engineers”, MJP Publishers, 2011.
4. J. P Tremblay, R. Manohar, “Discrete Mathematical Structures with Applications to Computer Science “, McGraw – Hill International Edition, 1987.
5. Zobel Justin, “Writing for Computer Science”, Springer Publications, 2004.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify and understand the performance of the algorithms **-K1,K2**

CO2: apply different statistical test to research problems **-K3**

CO3: analyze the research problems using mathematical tools **-K4**

CO4: develop new algorithms and compare with existing **-K5, K6**

CO5: write thesis and research articles **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	S	S	S	S	S	S
CO4	S	S	S	S	M	S	S	S	S	S
CO5	S	S	S	M	M	S	S	S	S	S

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.S.Murugan & Dr.K.Mani
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-II Advanced Topics in Computer Science	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • learn evolution of big data, need for big data and big data analytics • know the characteristics of cloud computing, technologies, platform, storage and various cloud services • gain knowledge in soft computing through Artificial Intelligence, Fuzzy Sets and Neural Networks • study the concept of machine learning and its algorithms • attain the knowledge on IoT 	

Unit-I Bigdata

Classification of Digital Data - Characteristics of Data - Evolution of Big Data - Definition of Big Data - Challenges with Big Data - What is Big Data – Need of Big Data – Consumer or producer of Big data – business Intelligence - Data Warehouse Environment- Hadoop Environment - Big Data Analytics : Big Data Analytics - Classification of Analytics - Greatest Challenges that Prevent Businesses from Capitalizing on Big Data - Challenges in Big Data – Importance of Big Data Analytics - Technologies in Big data - Data Science - Basically Available Soft State Eventual Consistency (BASE) -Big data Analytics Tools

Unit-II Cloud Computing

Characteristics of cloud computing - cloud deployment Model - Cloud Service models - Cloud concept and technologies: virtualisation - load balancing - scalability and elasticity – deployment - replication – monitoring - identity and access management - Service level agreements - billing - Cloud services and platforms: classification of cloud services – computing - storage – database - application - Analytics - network and deployment services

Unit-III Soft Computing

Introduction - Software computing constituents of conventional AI – Fuzzy set theory: Fuzzy sets – Fuzzy rules and Fuzzy relationship – Neural Networks: Introduction – Architecture - Back propagation for feed forward networks – Perceptions

Unit-IV Machine Learning

Machine Learning: Examples of Machine Learning Applications: Classification-Regression- Unsupervised Learning - Reinforcement Learning- Supervised Learning: VC Dimension - PAC Learning - Noise - Learning Multiple Classes - Regression - Model Selection and Generalization - Dimensions of Supervised Machine Learning Algorithm - Bayesian Decision Theory: Classification - Losses and Risks - Discriminant Functions -Clustering: Mixture

Densities - k -Means Clustering - Expectation-Maximization Algorithm - Mixtures of Latent Variable Models - Supervised Learning after Clustering - Hierarchical Clustering

Unit-V Internet of Things

Putting the Internet of Things forward to the Next Level - Internet of Things Strategic Research and Innovation Agenda : Internet of Things Vision - Internet of Things Strategic Research and Innovation Directions - IoT Smart X Applications - Network and Communications - Processes - Data Management - Security, Privacy and Trust - IoT6 Architecture - DigCovery - IoT6 Integration with the Cloud and EPICS – Enabling Hetrogeneous Integration - IoT6 Smart Office Use Case - Scalability Perceptive

Books for Study:

1. Seema Acharya, SubhashiniChellappan, “Big Data and Analytics”, Wiley India Pvt. Ltd, New Delhi, First Edition, 2015, ISBN: 978-81-265-5478-2
2. ArshdeepBahga, VijayMadiseti, “Cloud Computing – A Hands on Approach”, University Press, 2015, ISBN - 978-8173719233
3. J.S.R Jang, C.T Sun and E.Mizutani, “Neuro – Fuzzy and Soft Computing – A computational Approach to Learning and Machine Intelligence”, PHI Learning Private Ltd., New Delhi,2012,ISBN-10: 9332549885,ISBN-13: 978-9332549883
4. Ethem Alpaydin, “Introduction to Machine Learning”,3rd Edition, Prentice Hall, New Delhi ,2015.Jason Bell,”Machine Learning for Big Data”,Wiley Publication,2014.
5. Vidiu Vermesan and Peter Fries, “Internet of Things - From Research Innovation to Market Deployment”, River Publishers, 2014.

Books for Reference:

1. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.
2. Arshdeep bahga , Vijay madiseti ,” Cloud computing A hands on approach”, Universities Press (India) private limited ,2013.
3. Prasant kumar pattnaik, Rajib Mall, “Fundamentals of mobile computing”, PHI Learning Pvt. Ltd. New delhi-2012.
4. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking: Techniques and Applications”, 2011 print, Springer Science, ISBN: 978-1-4419-7735-9 (Chapters 1,2,4,5 & 6)

Web Reference:

1. https://kkpatel7.files.wordpress.com/2015/04/alppaydin_machinelearning_2010.pdf
2. http://www.internet-of-things-research.eu/pdf/IERC_Cluster_Book_2014_Ch.3_SRIA_WEB.pdf

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** apply various KDD process in bigdata **-K1, K2**
CO2: understand the basics of cloud computing and services **-K2**
CO3: apply neuro-fuzzy soft computing techniques to solve research problems **-K3**
CO4: understand and compare various machine learning algorithms **-K4**
CO5: identify IoT architecture and cloud service **-K2**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	M	M	M	S	S	S	M	M	M
CO2	S	M	S	M	S	S	S	S	M	M
CO3	S	S	M	M	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	M	M
CO5	S	S	S	M	S	S	S	S	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.K.Mani, Dr.D.Jayachitra, Mrs.V.Priya & Ms.P.Kalpana
Verified by	Dr.S.Murugan

Course Code & Title	CC - III Teaching and Learning Skills	
M.Phil	Semester I	Credit 4
Cognitive Level	K2 – Understand K3 – Apply K4 – Analyze K 5 – Evaluate	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • acquaint the integration of ICT in teaching and learning • acquire the knowledge of communication skill with special reference to its elements, types, development and styles • attain the knowledge of Instructional Technology and its applications • appreciate and use e-learning resources available • develop different teaching skills for putting the content across to target audience 	

Unit I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations - ICT for Professional Development : Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II : Communications Skills

Communication: Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching- learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment

Teaching skills: Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment 'for' learning; tools for self & peer assessment (recording devices; e-rubrics, etc.); online assessment (open source software's; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

Books for Reference:

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: [www.namahn.com/resources/ .../note-e-learning.pdf](http://www.namahn.com/resources/.../note-e-learning.pdf).
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
3. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weert, UNESCO, 2002.
4. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. *Innovations in Education & Teaching International*, 43(1), 15-27.
5. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
6. Learning Management system:
https://en.wikipedia.org/wiki/Learning_management_system
7. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
8. Michael, D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york.
9. Pandey, S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
10. Ram Babu, A abd Dandapani, S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
11. Singh, V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
12. Sharma, R.A., (2006) Fundamentals of Educational Technology, Surya Publications, Meerut

13. Vanaja, M and Rajasekar, S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** use instructional technology effectively in a classroom **-K2**
- CO2:** mastering over communication process **-K3**
- CO3:** apply lecture techniques and evaluation **-K3**
- CO4:** understand and use e-learning tools **-K4**
- CO5:** evaluate the methods to be applied **-K5**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	M	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	W	S	S	M	M
CO4	S	S	M	S	S	M	S	S	M	S
CO5	S	S	S	M	M	M	S	S	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Course Code & Title	CC – IV a Big Data Technology and Analytics	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • understand the basics of Big Data • obtain the knowledge of Big Data mining • state the importance of context in Big Data, Text categorization and Multi-label Big Data mining • acquire skill on High Dimensional Data clustering for Big Data • study Machine Learning and Incremental Learning with Big Data 	

Unit - I

Introduction to Big Data: Introduction - Definition for Big Data - Mining Unstructured data: Challenges and Modern Techniques - Unstructured Data Mining Applications- Context Building - Building Application and Dealing with Big data - Big data and Learning - Analytics and Big Data - Text Analytics and Big Data - Understanding Text Analytics - Business Intelligence products to handle Big Data - Unstructured Data Mining and Classification Methods - Big Data and Machine Learning Trends. **Data Mining and Modelling:** Introduction - Data Models - stages of Data Mining - Data Mining and knowledge Recovery - Aspects of Data Mining - Data Mining Approaches - Crawling the web and Information Retrieval.

Unit - II

Big Data Mining - Application Perspective: Introduction - Big Data Mining - Data Mining with Big Data - **Long Live the Kind of Big Data - The Context:** Introduction to context - context and unstructured Big Data - Use of Contextually enabled data - context issue in Big Data with unstructured Big Data- Context Types - Context in User Data - Contextual Analytics - Advantages of Contextual Analytics - Using Apache-Hadoop for Context Aware Recommendation System.

Unit - III

Big Data, Text Categorization and Topic Modelling: Introduction - Corpus representation - Context based Learning - Gate JAPE Rules - Topic Modelling - Situation Modelling - Big Data and Text Classification. **Multi-label Big Data Mining:** Introduction - Phases in Multi-label Unstructured Text Mining - Graph based model- Graph representation - Text Operation using Graph Model

Unit -IV

Distributed High Dimensional Data Clustering for Big Data: Introduction - Applications of Distributed subspace clustering - High Dimensional Data Clustering - Dimensionality reduction - subspace clustering - Distributed Systems - Types of Distributed Databases - Types of Transmission of Data - Distributed Clustering - Text data Clustering - Data Representation for Clustering Text Data - Text Clustering System - Subspace clustering in Text Data - Big data Clustering

Unit - V

Machine Learning and Incremental Learning with Big Data: Introduction - Machine Learning: Concepts - Big Data and Machine Learning - Incremental Learning - Incremental Learning for Knowledge Building - Incremental Techniques to Handle Big Data - Applications.

Books for Study:

1. Parag Kulkarni, Sarang Joshi and Meta S. Brown, "BIG DATA ANALYTICS ", PHI Learning Private Limited, New Delhi, 2016

Books for Reference:

1. Judith Hurwitz, Alan Nugent, Dr. Fern Halper and Marcia Kaufman, " Big Data for Dummies", A Wiley Brand, 2013, ISBN:978-1-118-50422-2.
2. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, "Understanding Big Data", Tata McGraw Hill publishing Limited, ISBN:978-0-07-179053-6.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the need for big data analytics	-K1, K2
CO2: apply and evaluate techniques for mining big data	-K3, K5
CO3: analyze the research problems using bigdata	-K4
CO4: build distributed data cluster	-K6
CO5: understand big data with machine learning algorithms	-K2

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	S	S	M	M	S	S	M	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Ms.P.Kalpana
Verified by	Dr.D.Jayachitra

Course Code & Title	CC – IV b Wireless Communication and Networks	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • understand the basics of global cellular network • study wireless communication technology and networking • obtain the knowledge of wireless networking • define and describe cordless system and wireless local loop • gain the skill on wireless LAN 	

Unit-I Introduction

The Cellular Revolution – The Global Cellular Network – Broadband – The Trouble with wireless – Technical Background:- Transmission Fundamentals: Signals for Conveying Information – Analog and Digital Data Transmission – Channel Capacity – Transmission Media – Multiplexing .

Unit-II Wireless Communication Technology

Antennas and Propagation: Antennas – Propagation Modes – Line-of-Sight Transmission – Fading in the Mobile Environment – Signal Encoding Techniques: Signal Encoding Criteria – Digital Data, Analog Signals – Analog Data, Analog Signals – Analog Data , Digital Signals.

Spread Spectrum:The Concept of Spread Spectrum – Frequency Hopping Spread Spectrum – Direct Sequence Spread Spectrum – Code-Division Multiple Access – Generation of Spreading Sequences – **Coding and Error Control:** Error Detection - Block Error Correction Codes – Convolutional Codes – Automatic Repeat Request

Unit-III Wireless Networking

Satellite Communications: Satellite Parameters and Configurations – Capacity Allocation-Frequency Division – Capacity Allocation-Time Division

Cellular Wireless Networks: Principles of Cellular Networks – First Generation Analog – Second Generation TDMA – Second Generation CDMA – Third Generation Systems

Unit-IV Cordless System and Wireless Local Loop

Coreless Systems – Wireless Local loop – IEEE 802.16 fixed Broadband Wireless Access Standard - **Mobile IP and Wireless Access Protocol:** Mobile IP – Wireless Application Protocol

Unit-V Wireless LAN

Wireless LAN Technology- Infrared LANs – Spread Spectrum LANs – Narrowband Microwave LANs – IEEE 802.11 Wireless LAN Standard: IEEE 802 Protocol Architecture – IEEE 802.11 Architecture and Services - IEEE 802.11 Medium Access Control - IEEE 802.11 Physical Layer

Bluetooth:

Radio Specification – Baseband Specification – Link Manager Specification – Logical Link Control and Adaptation Protocol.

Books for Study:

1. William Stallings , Wireless Communications and Networks ,second Edition,Pearson Education,2004
2. Kaveh Pahlavan, Prashant Krishnamurthy ,Principles of Wireless Networks –Printice – Hill of India Private Ltd. New Delhi. 2004

Books for Reference:

1. Jon W.Mark,Wei-hna Zhuang, “Wireless Communications and Networking”, Second Edition, , John Wiley & Sons Inc 2002.
2. Theodore S.Rappaport “Wireless Communications Principles & Practices” Prentice Hall, Jan 2002.

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** identify and understand cellular network and wireless communication **-K1,K2**
CO2: apply wireless communication technologies to research problems **-K3**
CO3: understand satellite communications and cellular wireless network **-K2**
CO4: learn cordless system **-K2**
CO5: design and modify WLAN protocols **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	S	S	S	W	S	S	S	S	S
CO3	S	S	M	S	W	M	S	S	M	M
CO4	S	S	M	S	M	W	S	S	M	M
CO5	S	S	S	S	M	M	S	S	S	S

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Mrs.V.Priya
Verified by	Dr.S.Murugan

Course Code & Title	CC – IV c Cloud Computing	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • learn the cloud computing architecture and model • acquire the knowledge on cloud hardware and software infrastructure • understand the operating system of cloud services • obtain the skill on cloud programming paradigm • attain the knowledge on security services on cloud 	

Unit-I

Cloud Architecture and Model: Cloud Computing – Overview – System Models for Distributed and Cloud Computing – Cloud Models: Characteristics– Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions Cloud ecosystem – Service management – Computing on demand- Applications- Intranets and the Cloud– Cloud Computing Services– Discovering Cloud Services- Development Services and Tools.

Unit-II

Cloud Infrastructure: Cloud hardware and infrastructure-clients-network-services-platforms-cloud storage- Layered Cloud Architecture Development - Cloud software architecture issues- Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Unit-III

Operating System for the Cloud - Application Patterns and Architecture – Case Studies- Cloud Computing services available under various platforms.

Unit-IV

Programming Model: Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache.

Unit-V

Security In The Cloud: Security Overview – Cloud Security Challenges and Risks – Software as a Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security Identity Management and Access Control – Autonomic Security.

Books for Study:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, "Cloud Computing Principles and Paradigms", John Wiley and Sons, Inc, 2011.

Books for Reference:

1. George Reese, "Cloud Application Architectures", O'Reilly Media, Inc, First Edition, 2009.
2. Michael Miller, "Cloud Computing: Web based Applications That Change the Way You Work and Collaborate Online", QUE Publishing, 2009.

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** understand cloud basics, architecture, applications and its services **-K1,K2**
CO2: understand and apply cloud services **-K3**
CO3: analyze the cloud computing service under various platform **-K4**
CO4: learn and apply hadoop map reduce **-K3**
CO5: design and develop secured cloud service **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	M	S	S	S	S	S
CO3	S	S	M	M	S	M	S	M	M	M
CO4	S	S	M	S	M	W	S	M	M	S
CO5	S	S	S	M	M	M	S	M	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.D.Jayachitra
Verified by	Mrs.V.Priya

Course Code & Title	CC-IV d Web Mining	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • learn the basics of information retrieval • understand social network analysis • attain the skill on web crawling • state opinion mining • gain the knowledge on web usage mining 	

Unit-I

Information Retrieval and Web Search: Basic Concepts of Information Retrieval - Information Retrieval Models - Text and Web Page Pre-Processing - Inverted Index and Its Compression - Latent Semantic Indexing - Web Search - Meta-Search: Combining Multiple Rankings - Web Spamming.

Unit-II

Social Network Analysis: Social Network Analysis - Co-Citation and Bibliographic Coupling – PageRank – HITS - Community Discovery.

Unit-III

Web Crawling: A Basic Crawler Algorithm - Implementation Issues - Universal Crawlers - Focused Crawlers - Topical Crawlers.

Unit-IV

Opinion Mining and Sentiment Analysis: The Problem of Opinion Mining - Document Sentiment Classification - Sentence Subjectivity and Sentiment Classification - Aspect-Based Opinion Mining - Mining Comparative Opinions - Opinion Search and Retrieval - Opinion Spam Detection.

Unit-V

Web Usage Mining: Data Collection and Pre-Processing - Data Modeling for Web Usage Mining - Discovery and Analysis of Web Usage Patterns - Recommender Systems and Collaborative Filtering - Query Log Mining.

Books for Study:

1. Bing Liu, "Web Data Mining Exploring Hyperlinks, Contents, and Usage Data", Second Edition, 2011 print, Springer ISBN 978-3-642-19459-7.

Books for Reference:

1. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", 2002 print, Morgan Kaufmann Publishers, ISBN: 978-1-55860-754-5
2. Matthew A. Russell, "Mining the Social Web", 2nd Edition, O'Reilly Media Publications, October 2013 print, ISBN-13: 978-1449367619
3. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking: Techniques and Applications", 2011 print, Springer Science, ISBN: 978-1-4419-7735-9

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** identify the functionality of web crawling and web usage mining **-K1,K2**
CO2: understand and analyze the web data **-K2**
CO3: analyze the algorithms to mine social media content **-K3**
CO4: understand and apply opinion mining on web data **-K3**
CO5: develop new algorithms to mine the web with web usage mining **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	M	M	S	S	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.K. Sridevi
Verified by	Dr.M.Muralidharan

Course Code & Title	CC-IV e Data Mining and Warehousing	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • describe data mining and data preprocessing • understand association rule mining • obtain the knowledge on classification and prediction • acquire the skill on cluster analysis • state the model and methods of data warehouse 	

Unit-I Data Mining & Data Preprocessing

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization

Unit–II Association Rule Mining

Introduction - Data Mining Functionalities - Association Rule Mining - Frequent Item set Mining Methods: Apriori Algorithm: Finding Frequent Item sets using Candidate Generation- Generating Association Rules from Frequent Itemsets- A Pattern-Growth Approach for Mining Frequent Itemsets.

Unit–III Classification & Prediction

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Associative Classification – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

Unit-IV Clustering:

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint- Based Cluster Analysis – Outlier Analysis

Unit-V Data Warehouse

Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.

Books for Study

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” , Second Edition, Elsevier, Reprinted 2008., ISBN 13: 978-1-55860-901-3

Books for Reference:

1. K.P. Soman, Shyam Diwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006., ISBN-10: 8120328973; ISBN-13: 978-8120328976
2. G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006., ISBN-10: 8120343263; ISBN-13: 978-8120343269

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the KDD process and data preprocessing	-K1,K2
CO2: apply the techniques in association rule in data mining	-K3
CO3: apply the algorithms in classification and prediction	-K4
CO4: develop new algorithms in clustering	-K5
CO5: build the knowledge of data warehousing in forming data warehouses	-K6

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	S	S	S	M	M	S
CO5	S	S	S	M	S	S	S	M	M	M

Strongly Correlating(S) Moderately Correlating (M) Weakly Correlating (W)

Prepared by	Dr.D. Jayachitra
Verified by	Dr.S.Murugan

Course Code & Title	CC- IV f Cryptography and Network Security	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • identify types of attacks and security mechanisms • learn symmetric key algorithms • attain the skill on digital certificates • understand user authentication and Kerberos • state the protocols on network security 	

Unit-I

Security Goals :Types of Attacks – Services and Mechanisms – Techniques - Cryptography Concepts and Techniques :Introduction – Plain Text and Cipher Text – Substitution Techniques – Transposition Techniques – Encryption and Decryption – Symmetric and Asymmetric Key Cryptography – Steganography – Key Range and Key size.

Unit-II

Symmetric Key Algorithms:Introduction – Algorithms types and Modes – Data Encryption Standard (DES) – International Data Encryption Algorithm (IDEA) – Blowfish-AES- Asymmetric Key Algorithms and Digital Signatures:Introduction – The RSA Algorithm – Digital Signatures

Unit- II

Digital Certificates and Public Key Infrastructure (PKI):Introduction – Digital certificates – Private Key Management – XML, PKI and Security. Internet Security Protocols :Introduction – Basic Concepts – Secure Socket Layer (SSL) – Secure Electronic Transaction (SET) –SSL Versus SET- Email Security – WAP Security.

Unit-IV

User Authentication and Kerberos: Introduction – Authentication Basics – Passwords – Authentication Tokens – Certificate based Authentication – Biometric Authentication – Kerberos – Cryptographic Solutions – Key Management.

Unit-V

Network Security : Introduction -Firewalls –IP Security- Trusted Systems .Case Studies: Cookies and Privacy

Books for Study:

1. William Stallings ,“Cryptography and Network Security”, Seventh Edition, Pearson Prantice Hall,2016.

Books For Reference:

1. Bruce Schneier, “Applied Cryptography Protocols, Algorithms”, Second Edition, , John Wiley & Sons Inc 2002.
2. Richard E.Smith, “Internet Cryptography” ,Addison –Wasley Professional Aug 1997.
3. Atul Kahate, “Cryptography and Network Security”, Second Edition, Tata McGraw-Hill Publishing Company Limited, 2008
4. Behrouz A. Forouzan, “Cryptography and Network Security”, Tata McGraw-Hill Publishing Company Limite,2007.

Course Outcomes:

On completion of the course, the students will be able to

- CO1:** identify various algorithms to secure data on network **-K1,K2**
CO2: apply network security algorithms to research problems **-K3**
CO3: analyze the algorithms to enhance the security of network **-K4**
CO4: compare the authentication services and enhance **-K5**
CO5: design algorithms of their own to enhance network security **-K6**

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	M	M	S	M	S	M	M	M
CO4	S	S	M	S	M	W	S	M	M	S
CO5	S	S	S	M	S	M	S	M	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.S.Murugan
Verified by	Dr.K.Mani

Course Code & Title	CC – IV g Machine Learning	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze K6 – Create	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • learn the basics of concept learning and algorithms • study decision tree learning and comparison of algorithms • understand Bayesian learning • gain the knowledge on instance based learning • attain the skill on analytical learning 	

Unit- I:

Well-Posed Learning Problems – Designing a Learning System – Perspective and Issues in Machine Learning – Concept learning Task –Concept Learning as search – Version Spaces and the candidate Elimination Algorithm – Remarks on Version Spaces and Candidate – Elimination – Inductive Bias.

Unit- II:

Decision Tree Learning- Representation- Appropriate problems for decision tree learning – Basic Decision Tree Learning Algorithm - Hypothesis Space Search –Inductive Bias –Issues in Decision Tree Learning – Evaluating Hypothesis – Motivation – Estimating Hypothesis Accuracy – Basics of sampling theory – A general approach for deriving confidence intervals – Difference in Error of two hypothesis – Comparing learning algorithms

Unit- III

Bayesian learning – Bayes theorem –Bayes theorem and concept learning –Bayes Optimal Classifier – Gibbs algorithm – Naive Bayes classifier – Bayesian belief networks – EM algorithm – Computational Learning theory –Probably learning an approximately correct hypothesis – Sample Complexity for finite hypothesis Spaces - Sample Complexity for infinite hypothesis Spaces – The mistake bound model of learning

Unit-IV

Instance Based learning – K-nearest neighbor learning – locally weighted regression – radial basis function – case based reasoning – remarks on lazy and eager learning –Learning sets of rules – Sequential covering algorithm – learning rules sets –learning first order rules – learning sets of first order rules(FOIL) – Induction as inverted Deduction –Inverting resolution

Unit-V

Combining Inductive and analytical learning –Inductive analytical approaches to learning – using prior knowledge to initialize the hypothesis – Using prior knowledge to alter the search objective- Using prior knowledge to augment search – Reinforcement Learning – Learning task - Q-learning – Nondeterministic rewards and actions – temporal difference learning-generalizing from examples –relationship to dynamic programming

Books for Study:

1. Tom M.Mitchell, “Machine Learning”, McGraw-Hill, First Edition,2013, ISBN :0070428077

Books for Reference

1. Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Edition, Prentice Hall, New Delhi ,2015.Jason Bell, ”Machine Learning for Big Data”, Wiley Publication,2014.

Course Outcomes:

On completion of the course, the students will be able to

CO1: identify the basics of machine learning and algorithms	-K1,K2
CO2: apply decision tree learning	-K3
CO3: analyze and understand Bayesian learning	-K4
CO4: apply instance based learning to research problems	-K3
CO5: design new machine learning algorithms	-K6

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	M	S	S	M	M	M
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	S	S	M	S	S	S	M	M	M
CO4	S	S	S	S	S	S	S	M	M	S
CO5	S	S	S	S	S	S	S	M	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.M.Muralidharan
Verified by	Dr.K.Mani

Course Code & Title	CC – IV h Social Network Analytics	
M.Phil	Semester I	Credit 4
Cognitive Level	K1 – Recall K2 – Understand K3 – Apply K4 – Analyze	
Learning Objectives	This Course aims to <ul style="list-style-type: none"> • understand the components of the social network • model and visualize the social network • mine the users in the social network • understand the evolution of the social network • know the applications in real time systems 	

Unit I

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks.

Unit II

Modeling and Visualization: Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix-Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

Unit III

Mining Communities: Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

Unit IV

Evolution: Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction – Bayesian Probabilistic Models - Probabilistic Relational Models.

Unit V

Applications: A Learning Based Approach for Real Time Emotion Classification of Tweets, A New Linguistic Approach to Assess the Opinion of Users in Social Network Environments, Explaining Scientific and Technical Emergence Forecasting, Social Network Analysis for Biometric Template Protection

REFERENCES:

1. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snasel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2012
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2011
3. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2014
4. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
5. Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking- Techniques and applications", Springer, 1st edition, 2012
6. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.
7. Przemyslaw Kazienko, Nitesh Chawla, "Applications of Social Media and Social Network Analysis", Springer, 2015

Course Outcomes:

On completion of the course, the students will be able to

CO1: understand the internal components of the social network	-K1,K2
CO2: apply social network model and visualizations	-K3
CO3: analyze the mining communities in the social network	-K4
CO4: understand evolutions of social networking	-K2
CO5: learn the real time application of social networks	-K2

Mapping of COs with POs & PSOs:

CO/PO	PO						PSO			
	1	2	3	4	5	6	1	2	3	4
CO1	S	S	M	M	W	S	S	M	M	M
CO2	S	M	S	S	W	S	S	S	S	S
CO3	S	S	M	M	S	S	S	M	M	M
CO4	S	S	M	S	M	S	S	M	M	S
CO5	S	S	S	M	M	S	S	M	M	M

Strongly Correlating(S)

Moderately Correlating (M)

Weakly Correlating (W)

Prepared by	Dr.K.Sridevi
Verified by	Dr.D.Jayachitra