# Ph.D., COMPUTER SCIENCE
# CHOICE BASED CREDIT SYSTEM (CBCS)

# Syllabus

# Regular (2020 – 2021)

**Enable | Enlighten | Enrich**

**KARPAGAM**
**ACADEMY OF HIGHER EDUCATION**
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956 )

## DEPARTMENT OF COMPUTER SCIENCE
## FACULTY OF ARTS, SCIENCE AND HUMANITIES

## KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
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# DEPARTMENT OF COMPUTER SCIENCE
## FACULTY OF ARTS, SCIENCE AND HUMANITIES
### Ph.D Computer Science
### (2020–2021 Batch and onwards)

| Course code | Name of the course | Instruction hours / week | | | Credit(s) | Maximum Marks | Page No |
|---|---|---|---|---|---|---|---|
| | | L | T | P | | ESE (100) | |
| 20RCS101 | Research Methodology and Pedagogy | 4 | - | - | 4 | 100 | 1 |
| 20RCS201 | Research Publication Ethics | 4 | - | - | 4 | 100 | 4 |
| 20RCS301 | Cryptography and Network Security | 4 | - | - | 4 | 100 | 6 |
| 20RCS302 | Advanced Networking | 4 | - | - | 4 | 100 | 9 |
| 20RCS303 | Data Mining and Warehousing | 4 | - | - | 4 | 100 | 11 |
| 20RCS304 | Digital Image Processing | 4 | - | - | 4 | 100 | 14 |
| 20RCS305 | Soft Computing | 4 | - | - | 4 | 100 | 16 |
| 20RCS306 | Web Technology | 4 | - | - | 4 | 100 | 19 |
| 20RCS307 | Software Engineering | 4 | - | - | 4 | 100 | 22 |
| 20RCS308 | Cyber Security | 4 | - | - | 4 | 100 | 24 |
| 20RCS309 | Mobile Computing | 4 | - | - | 4 | 100 | 27 |
| 20RCS310 | Cloud Computing | 4 | - | - | 4 | 100 | 29 |
| 20RCS311 | Internet of Things | 4 | - | - | 4 | 100 | 31 |
| 20RCS312 | Artificial Intelligence | 4 | - | - | 4 | 100 | 34 |

**20RCS101**          **Paper-I Research Methodology and Pedagogy**          **4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0**          **Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To construct a coherent research proposal that includes an abstract, introduction, literature review, research questions, ethical considerations, and methodology
- To understand the methods of data collection
- To make the students understand the techniques in report writing
- To understand the use of statistical analysis
- To enable the students to understand the evaluation of research.

**Course Outcomes (COs)**

1. Read, interpret, and critically evaluate social research.

2. Identify, explain, and apply the basic concepts of research, such as variables, operationalization, sampling, reliability, and validity.

3. Recognize the ethical issues involved in research, and practice ethical research standards.

4. Identify and explain the difference between quantitative, qualitative, and mixed methods research and what types of research questions can be answered with each method.

5. Use theory and previous research to create research questions and hypotheses and to identify and analyze the appropriate method and variables needed for research questions.

6. Use a variety of research methods through hands-on experience.

**Unit I - RESEARCH METHODOLOGY**

Research Methodology: Meaning of Research – Objectives of Research – Motivation in Research – Types of Research – Research Approaches – Significance of Research – Research methods versus methodology. Research and Scientific Method – Importance of knowing how Research is done – Research process – Criteria for good Research – Problems encountered by Researchers in India. Journal Reading Techniques - Defining the Research problem – What is the Research Problem – Selecting the Problem – Necessity of Defining the problem – Technique involved in Defining the Problem – An illustration – Conclusion.

## Unit II - METHODS OF DATA COLLECTION

Collection of primary data – Collection of data through questionnaires – Schedules – Differentiation between questionnaires and schedules – Other methods of data collection – Collection of secondary data – Selection of appropriate method for data collection– Guidelines for constructing questionnaire/Schedule–Guidelines for successful Interviewing – Difference between survey and experiment – Data Collection using Journals

## Unit III - RESEARCH DESIGN

Need for Research Design – Features of good design – Important concepts relating to Research Design – Different Research Design – Basic principles of Experimental Designs – Conclusion – Developing a Research Plan. Significance of Report Writing – Different steps in writing Report – Layout of the Research Report – Types of Reports – Oral presentation – Mechanics of writing a Research Report – Precautions for writing a Research Reports – Conclusions.

## Unit IV - STATISTICAL ANALYSIS

Central tend in correlation, auto correlation and regression analysis, curve fitting - probability models-distribution. Testing of hypothesis- Analysis variance, testing means for small and large sequence. Simulation-render generation techniques and distribution monte carlo model. Data Analysis: Mathematical and statistical analysis using software tools.

## Unit V - PEDAGOGICAL METHODS IN HIGHER EDUCATION

Objectives and roll of higher education- important characteristics of an effective Lecture-Quality teaching and learning- Lecture preparation Characteristics of instructional design Methods of teaching and learning: Large Group – Technique-Lecture Seminar, Symposium, Tam Teaching, Project, Small group Technique- Simulation, role playing Demonstration, Brain storing, case discussion and assignment, Methods of evaluation- Self evaluation, student evaluation. Diagnostic testing remedial teaching Question banking-Electronic media in education –'e' learning researches web based learning.

## SUGGESTED READINGS

1. Deepak Chawla , Neena Sondhi. (2016). Research Methodology: Concepts and Cases. 2nd Edition. Vikas Publishing House Private Ltd, New Delhi.
2. C.R. Kothari. (2018). Research Methodology – Methods and Techniques. 2nd Edition. New Age International (P) Limited. New Delhi.

3. Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams . (2018). The Craft of Research . 3$^{rd}$ Edition, University of Chicago Press.

4. C Eileen M. Trauth. (2001). Qualitative Research in IS: Issues & Trends. IDEA Group Publishing. USA/London  (ISBN: 1-930708-06-08)

5. www.dcs.gla.ac.uk/~johnson/teaching/research_skills/research.html

6. http://www.csc.liv.ac.uk/~ullrich/COMP516

7. http://www.idi.ntnu.no/~thomasos/paper/interpretive.pdf

8. Vedanayagam, E.G .(1989).  Teaching technology for college teachers. Sterling Publishers(P) Ltd., New Delhi.

7.  Kumar K.L. (1997) Educational Technologies, New age International. New Delhi.

8. Winkler, Anthony C. & Jo Roy Mc Cuen. (1985). Writing a research Paper: A Handbook, 2$^{nd}$ edition, Harcourt,NY.

**20RCS201 RESEARCH PUBLICATION ETHICS 4H-4C**

**Instruction hours/week: L: 4 T: 0 P: 0 Marks:100** **End Semester Exam:** 3 Hours

## Unit I - Philosophy and Ethics

Introduction to Philosophy : Definition, nature and scope, concept, branches – Ethics: Definition, moral philosophy, nature of moral judgments and reaction.

## Unit II - Scientific Conduct

Ethics with respect to science and research – Intellectual honesty and research integrity – scientific misconduct: Falsification – Fabrication – Fabrication and Plagiarism (FFP) – Redundant publications: duplicate and overlapping publication-salami slicing- selective reporting and misrepresentation of date.

## Unit III - Publication Ethics

Publication Ethics: Definition , introduction and importance- Best practices/ standards setting initiatives and guidelines : COPE, WAME, etc. – Conflicts of interest – publication misconduct: definition , concept , problems that lead to unethical behavior and vice versa, type- violation of publication ethics , authorship and contributing and appeals- predatory publishers and journals.

## Unit IV - Publication Misconduct

Group discussions : Subject specific ethical issues, FFP, authorship – conflicts of interest-complaints and appeals : examples and fraud from India and abroad.

## Unit V - Development of E-content & IPR

Database : indexing database- citation database : web of science , scopus, etc.

Research Metrics : impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score – Metrics: h-index, g index, g index, I 10 index, altmetrics.

## Unit VI : Development of E-Content & IPR

Integrated Library Management System (ILMS) : e-journals – e-books – e-shodhsindu – shodhganga – database – e-content development – Learning Management system (LMS) – e-PG – Pathshala – CEC (UG) SWAYAM – MOOCs – NPTEL – NMEICT. IPR : Patent – Copyrights- trademark – Geographical Indication.

**PRACTICE:**

Open access publishing

Open access publications and initiatives-SHERPA/RoMEO online resource to check polisher copyright & self -archiving policies-software tool to identify predatory publications

developed by SPPU-Journal finder / journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

**20RCS301  Paper – III: Special Paper I -Cryptography and Network Security   4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0**          **Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To provide scholars with a theoretical knowledge to understand the fundamental principles of access control models and techniques and,
- To know about various encryption techniques.
- To understand the concept of Public key cryptography.
- To study about message authentication and hash functions
- To impart knowledge on Network security

**Course Outcomes(COs)**

On successful completion of the course the student should be able to:

1. Classify the symmetric encryption techniques
2. Illustrate various Public key cryptographic techniques
3. Evaluate the authentication and hash algorithms.
4. Summarize the intr usion detection and its solutions to overcome the attacks.
5. Understand basic concepts of system level security

**Unit I - INTRODUCTION TO CRYPTOGRAPHY**

Services. Mechanisms and Attacks – The OSI Security Architecture – A Model for Network Security – Classical Encryption Techniques –   Symmetric Cipher Model – Substitution Techniques – Transporation Techniques – Rotor Machines – Steganography.

**Unit II - SIMPLIFIED DES**

Block Cipher Principles – The Data Encryption Standard – The Strength of DES – Differential and Linear Cryptanalysis – Block Cipher Design Principles – Block Cipher Modes of Operation.

**Unit III –PUBLIC KEY CRYPTOSYSTEM**

RSA Algorithm – Key Management – Diffie–Hell man Key exchange – Introduction to Elliptic Curve Cryptography. Message Authentication and Hash functions – Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Functions – Security of Hash functions and MAC.

## Unit IV - DIGITAL SIGNATURES AND AUTHENTICATION PROTOCOLS&WEB SECURITY

Digital Signature Standard – Authentication Applications – Kerberos – X.509 Authentication services and Encryption Techniques. E–mail Security – PGP – S / MIME – IP Security-Secure Socket Layer – Secure Electronic Transaction. System Security – Intruders and Viruses – Firewalls– Password Security.

## Unit V – BLOCK CHAIN TECHNOLOGY

Block chain currency: Technology stack – How a cryptocurrency works – Block chain contracts- Financial services – crowd funding – Bitcoin prediction markets -Extensibility of block chain concepts – Fundamental Economic principles -Digital Identity verification – block chain neutrality – Digital divide of Bitcoin -Advanced concepts of Block chain – Limitations – Cryptocurrency Basics.

## SUGGESTED READINGS

1. Deepti Mittal, Ajay Raj. ( 2015). Cryptography and Network Security. 1stEdition, Laxmi Publication Private Ltd, Delhi.

2. K.HarBaskar . (2015). Cryptography and Network Security – A Practical Approach. 1stEdition, Laxmi Publication Private Ltd, Delhi.

3. William Stallings. (2012). Cryptography and Network Security. 4th Edition, Pearson Education, Delhi.

4. Behrouz A. Forouzan. (2010). Cryptography and Network Security. Special Indian Edition, Tata McGraw Hill, Delhi.

5. Roberta Bragg, Mark Rhodes-Ousley and Keith Strassberg. (2004). Network Security. 1st Edition, Tata McGraw Hill, Delhi.

6. Ankit Fadia. (1998). Network Security. 1st Edition, McMillan Publications, Delhi.

7. Bruce Schneir.(1998). Applied Cryptography. 1st Edition. CRC Press, New Delhi.

8. Menezes.A and Van Oorschot and Vanstone .S. (1997). Hand Book of Applied Cryptography". 1stEdition .CRC Press. (Free Downloadable)

9. William Stallings.(1998).Cryptography and Network Security. 3rd Edition, Pearson Education, New Delhi.

10. MelaineSwan(2015). Block chain Blue print for a new economy.4<sup>th</sup> Edition, O'reillymedia. Inc.

**WEB SITES**

1. http://domino.research.ibm.com/comm/research_projects.nsf/pages/security.index. html
2. http://whitepapers.techrepublic.com.com
3. http://www.rsa.com
4. http://www.nsa.gov/home_html.cfm

**20RCS302      Paper – III: Special Paper II - Advanced Networking      4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0         Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To study and compare various Network architectures and fundamental protocols.

- To learn various transmission media.

- To understand the topologies of networks, layered architecture (OSI and TCP/IP) and protocol suites.

- To understand the routing techniques

- To  study and compare the Adhoc network principles

**Course Outcomes (COs)**

1. Independently understand basic computer network technology.

2. Understand and explain Data Communications System and its components.

3. Identify the different types of network topologies and protocols.

4. Enumerate the layers of the OSI model and TCP/IP.

5. Employ fundamental computer theory to basic programming techniques.

6. Gain the skills and project-based experience needed for entry into web design and development careers.

**Unit I – INTRODUCTION**

Internet Protocol review, Router Basics – forwarding versus routing – ISPs – Evolution of the Internet Architecture – IP Addressing and Allocation Techniques – NAPs – Autonomous Systems.

**Unit II - ROUTING PROTOCOL FOUNDATIONS**

Distance vector and link state – Dijkstra's algorithm – IGPs and EGPs –  RIP –  OSPF – ISIS. Introduction to BGP – EBGP and IBGP

**Unit III - INTERDOMAIN ROUTING AND BGP**

Border Gateway Protocol details – messages and state machines – route aggregation. Policy and BGP – BGP decision process – Access lists, prefix lists, AS paths, Community – Route maps – Attributes – AS_Path, local preference, MED, Community, ATOMIC_AGGREGATE, Aggregator, Origin, NEXT_HOP, AS–SET – Route filtering.

Architecture and BGP – Redundancy, symmetry, load balancing – Confederations, route reflectors.

## Unit IV - AD–HOC/MOBILE ROUTING

Peer to Peer Overlay Networks – Mesh Networks – Sensor Networks – MANET

## Unit V- NETWORK SERVICE QUALITY AND RESOURCE RESERVATION

Queues and Delays – Queuing and Scheduling – A Reservation Protocol – Differentiated Services Network simulator tools NS2

## SUGGESTED READINGS

1. Andrew S. Tannenbaum. (2010). Computer Networks. 5th Edition. Pearson Education.
2. Forouzan, B. A.( 2011). Data Communications and Networking .4th edition. THM, New Delhi.
3. Bassam Halabi. Internet Routing Architectures. (2014). Cisco Press, New Riders Publishing, ISBN 1-56205-652-2
4. Christian Huitema. (2000). Routing in the Internet. 2nd Edition, Prentice Hall.
5. J. Stewart. (1999). BGP4 : Inter Domain Routing in the Internet. Addison Wesley.
6. W. Richard Stevens.(2005). TCP/IP Illustrated, Volume 1: The Protocols. Addison Wesley.
7. Pete Loshin. (2004). IPv6Theory, Protocol, and Practice. 2nd Edition, The Morgan Kaufmann Series.

## WEB SITES

1. http://www.academ.com/nanog/feb1997/BGPTutorial
2. http://www.ietf.org/html.charters/manet-charter.html
3. http://tools.ietf.org/html/rfc2475
4. http://www.ietf.org/rfc/rfc2205.txt

**20RCS303      Paper – III: Special Paper III - Data Mining and Warehousing   4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To provide grounding in basic and advanced methods to big data technology and Understand the Big Data Platform
- To Understand Map Reduce features
- To provide exposure to Graph databases Neo4J, Connecting your data and Dashboard
- To understand the cluster analysis
- To make the students to learn the tools

**Course Outcomes(COs)**

On successful completion of the course the student should be able to:

1. Apply Hadoop ecosystem components.
2. Analyze Map Reduce Types
3. Apply  Data Model and Connect your data and Dashboard
4. Participate data science and big data analytics projects
5. Implement the tools to solve the datasets

**Unit I - INTRODUCTION: FUNDAMENTALS OF DATA MINING**

Data Mining Functionalities - Classification of Data Mining systems - Major issues in Data Mining - Data Warehouse and OLAP Technology for Data Mining Data Warehouse - Multidimensional Data Model - Data Warehouse Architecture - Data Warehouse Implementation - Further Development of Data Cube Technology - From Data Warehousing to Data Mining.

Data Preprocessing: Needs Preprocessing the Data - Data Cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation - Online Data Storage. Preparing Data for Mining: Variable Measures.

**Unit II - DATA MINING PRIMITIVES**

Languages, and System Architectures: Data Mining Primitives - Data Mining Query Languages - Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems.

Concepts Description: Characterization and Comparison: Data Generalization and Summarization - Based Characterization - Analytical Characterization: Analysis of Attribute Relevance - Mining Class Comparisons: Discriminating between Different Classes - Mining Descriptive Statistical Measures in Large Databases.

## Unit III -  MINING ASSOCIATION RULES IN LARGE DATABASES

Association Rule Mining - Mining Single -Dimensional Boolean Association Rules from Transactional Databases - Mining Multilevel Association Rules from Transaction Databases - Mining Multidimensional Association Rules from Relational Databases and Data Warehouses - From Association Mining to Correlation Analysis – Constraint - Based Association Mining.

Classification and Prediction: Issues Regarding Classification and Prediction - Classification by Decision Tree Induction - Bayesian Classification - Other Classification Methods – Prediction - Classifier Accuracy.

## Unit IV -CLUSTER ANALYSIS INTRODUCTION

Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods – Density -Based Methods - Grid-Based Methods - Model-Based Clustering Methods - Outlier Analysis. Machine Learning: Basic Concepts in machine learning - Supervised and Unsupervised Learning. Mining Spatial Databases - Mining Multimedia Databases - Mining Time-Series and Sequence Data - Mining Text Databases - Mining the World Wide Web - Visual Data Mining

## Unit V - OVERVIEW OF DATA MINING TOOLS

**Applications:**

**Data Mining:** Data Mining in Bio Informatics - Data Mining in Banking - Data Mining in Tele communications - Data Mining in Crime Detection - Data Mining in Oil and Gas Industry - Data Mining in Pharmaceutical Industry - Data Mining in Student recruiting and retention - Data Mining in Electronic commerce .

Defining Privacy for Data Mining -  Trends in Spatial data mining.

**Data Warehousing:** Case Studies-Data warehousing in Government and Education – Insurance -  Manufacturing Industry – Marketing - Multi-Industry.

**SUGGESTED READINGS**

1.  Han, Kamber & Pei.  (2013). Data Mining: Concepts and Techniques. 3$^{rd}$ Edition. University Press.

2.  Zaki & Meira.  (2014) . Data Mining and Analysis Fundamental Concepts and Algorithms. Prentice Hall of India, New Delhi .

3.  Agarwal . (2015). Data Mining: The Textbook. Prentice Hall of India, New Delhi

4.  K.P.Soman, Shyam Diwakar, V.Ajay. (2006). Insight into Data Mining Theory and Practice, Prentice Hall of India.

5.  Jiawei Han & Micheline Kamber. (2001).  Data Mining – Concepts and Techniques, Harcourt, India.

5.  Arun K Pujari .(2001). Data Mining Techniques, University Press.

6.  Michael J. A.Berry, Gordon S.Linoff. (2007). Data mining Techniques, Second Edition.

7. Hillol Kargupta , Anupam Joshi, Krishnamoorthy Sivakumar and Yelena Yesha. (2005). Data Mining Next Generation Challenges and Future Directions, Prentice Hall of India.

8. G.K.Gupta. (2006). Introduction to Data mining with case studies, Prentice Hall of India.

**WEB SITES**

1.  http://www.the-data-mine.com/bin/view/Misc/ApplicationsOfDataMining

2.  http://www.biomedcentral.com/info/about/datamining

3.  http://www-users.cs.umn.edu/~han/kdd/kdd-info.html

4.  http://www.dmreview.com/article_sub.cfm?articleId=1046025

5.  http://www.datamining.databasecorner.com/?

6.  http://www.web-datamining.net/tools/

7.  http://databases.about.com/od/datamining/a/datamining.htm

8.  http://www.dwreview.com/DW_Overview.html

9.  www.kdnuggets.com

10. http://www.improvedoutcomes.com/docs/WebSiteDocs/Clustering/Clustering_Overview.

11. http://dms.irb.hr/tutorial/tut_dtrees.php

12. http://www.aaai.org/AITopics/pmwiki/pmwiki.php/AITopics/MachineLearning

13. http://robotics.stanford.edu/~nilsson/mlbook.html

**20RCS304      Paper – III: Special Paper IV - Digital Image Processing      4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0           Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To make the students learn the fundamental theories and techniques of digital image processing
- To cover the fundamental concepts of visual perception
- To know the basic techniques of image manipulation segmentation and coding and a preliminary understanding of Computer Vision
- To know the relationships between pixels
- To understand the techniques in compression and pattern recognition.

**Course Outcomes(COs)**

At the end of the course the students will be able to :

1. Perform image manipulations and analysis in many different fields.
2. Apply knowledge of computing mathematics science and engineering to solve problems in multidisciplinary research.
3. Apply knowledge to threshold an image
4. Implement the image compression using the lossy techniques.
5. Analyze pattern recognition.

**Unit I – INTRODUCTION**

Digital image processing – Origins of digital image processing- Examples of fields that use digital image processing-Fundamental steps in digital image processing- Components of an image processing system-Representing digital image.

**Unit II - BASIC RELATIONSHIPS BETWEEN PIXELS**

Basic gray level transformations- Histogram processing - Basic spatial filtering- Smoothing special filtering-Image Degradation/Restoration process-Noise Models.

**Unit III - IMAGE SEGMENTATION: THRESHOLDING**

Edge Based Segmentation – Region Based Segmentation – Matching. Image Compression: Error Criterion - Lossy Compression - Lossless Compression.

**Unit IV - SHAPE REPRESENTATION AND DESCRIPTION**

Region Identification - Contour Based Representation And Description – Region Based Shape Representation And Description

## Unit V - INTRODUCTION TO INFORMATION CODING

Introduction to image compression techniques Image Recognition: Introduction – Statistical Pattern Recognition - Neural Net- Syntactic Pattern Recognition - Graph Matching - Clustering

## SUGGESTED READINGS

1.      Rafael C. Gonzalez, Richard E. Woods. (2016). Digital Image Processing, 3$^{rd}$ Edition, Pearson Education, Delhi.

2.  T.Veerakumaran, S.Jayakumar.(2009).Digital Image Processing, 1$^{st}$ Edition,    Mcgraw Higher Ed, Delhi.

3.  Castleman .(2007). Digital Image Processing, 1$^{st}$ Edition, Pearson Education Limited, Delhi.

4.  Milan Sonka and Vaclav Hlavac and Roger Boyle. (2004). Image Processing, Analysis and   Machine Vision. 2$^{nd}$ Edition. Vikas Publishing House, NewDelhi.

5.  Nick Efford. (2000). Digital Image Processing – A Practical introduction using JAVA. 1$^{st}$ Edition , Pearson Education Limited, Delhi.

6.  Chanda. B and Dutta Majumder .D. (2000). Digital Image Processing and Analysis. 1$^{st}$ Edition, Prentice Hall of India, New Delhi

## WEB SITES

1.  www.icaen.uiowa.edu/~dip/lecture/lecture.html
2.  www.ece.ucsb.edu/~manj/ecei81bso4/reviue(gw2002).pdf
3.  www.wikipedia.org/wiki/image_processing
4.  http://unjobs.org/authors/rafael-c.-gonzalez/image processing

**20RCS305          Paper – III: Special Paper V – Soft Computing          4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To build intelligent and wiser machines.
- To derive the answer and not simply arrive to the answer in the fields of soft computing
- To increase purity of thinking machine intelligence freedom to work dimensions complexity and fuzziness handling capability.
- To understand the working of  resonance theory in networks.
- To understand the usage of fuzzy logic.

**Course Outcomes(COs)**

1. Universalize into domains where direct experience is absent
2. Can perform mapping from inputs to the outputs faster than inherently serial analytical representations
3. Can build intelligent and wiser machines
4. Implement the usage of networks in resonance
5. Analyze and implement the fuzzy algorithms

**Unit I** - **FUNDAMENTALS OF ARTIFICIAL NEURAL NETWORKS**

Biological prototype, Artificial neuron, Single layer artificial, neural networks, multilayer artificial neural networks, training of artificial neural networks.

**Unit II - PERCEPTIONS**

Perceptron Representation, perceptron learning, perceptron Training algorithm. Back propagation: Introduction to back propagations and Back propagation training algorithm, counter propagation networks.

**Unit III** - **KOHONEN SELF-ORGANIZING NETWORKS**

Introduction, the Kohonen algorithm, weight training, Grossberg layer, Training the Grossberg Layer.

## Unit IV - HOPFILED NETWORKS

Introduction, The Hopfiled model, Hopfiled network algorithm, Boltzmann's machine applications of Hopfiled Networks,Associative Memories, Bi- directional Associative Memories.Adaptive Resonance Theory: Architecture of Adaptive Resonance Theory,Algorithm, Applicability of Artificial neural Networks to pattern Recognition and Image Processing, Dimensionality of neural Networks for pattern Recognition- Case Studies

## Unit V - FUZZY ARITHMETIC

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, fuzzy numbers, and lattice of fuzzy numbers, Possibility theory**:** fuzzy measures, evidence theory, fuzzy sets and possibility theory, possibility Vs probability theory, Fuzzy logic: Multivalued logics, propositions, quantifiers, linguistic hedges, inferences. Uncertainty based information, Fuzzy systems: fuzzy controllers, fuzzy systems and neural networks, fuzzy neural networks, fuzzy automata, dynamic systems- Applications

## SUGGESTED READINGS

1.Chandra .S.S.V. (2014). Artificial Intelligence and Machine Learning. Kindle Edition.

2. Dr.R.P.Das. (2012). Neural Networks and Fuzzy Logic. 1st Edition, Tata Mcgraw Hill, Delhi

3. Flasiński, Mariusz. (2016). Introduction to Artificial Intelligence. Tata Mcgraw Hill, Delhi.

4. Dr.R.P.Das. (2012). Neural Networks and Fuzzy Logic. 1st Edition, Tata Mcgraw Hill, Delhi.

5. Neural computing: Theory and practice – Waserman

6. Sets and Fuzzy logic theory and applications—George J. Klir/Bo Yuan

7. S.N. Sivanandam, S. Sumathi and S. Deepa. (2006). Introduction to Neural Networks using MAT LAB 6.0, 1st Edition, Tata Mcgraw Hill, Delhi

8. Simon Haykin. (2003). Neural Networks. 1ST Edition, New Delhi: Pearson Education.

9. An introduction to Neural Computing – I. Alexander and Helen MartWilliam Jackson.

10. Robert J Schaluoss. (1997). Artificial Neural Networks. 1ST Edition, New Delhi: McGraw Hill.

11.Kishan Mehrotra, Chiluvuri K. Mohan and Sanjay Rana. (1997).Elements of Artificial Neural Networks. 1ST Edition, Mumbai: Penaram International.

**WEB SITES**

1. www.doc.ic.ac.uk/~nd/surprise_96/journal/vol4/cs11/report.html

2. http://www.statsoft.com/textbook/stneunet.html

3. http://www.fuzzy-logic.com

**20RCS306        Paper – III: Special Paper VI: Web Technology        4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To understand the various applications of XML in the areas of information representation, Presentation Oriented Publishing, Message Oriented Computing,and Application Configuration.Web Services Protocols
- To  use JSP and Java technologies to support the development of modern applications targeted to the evolving spectrum of distributed and decentralized enterprise platforms.
- To Expose the scholars to the advanced CGI enabled capabilities of the Java 2 development environment for Enterprise Applications.
- To Sharpen the practical development skills via focused assignments and projects.
- To enable the understanding in blogging in web application.

**Course Outcomes(COs)**

1. Understand the course structure and objectives
2. Understand what XML is all about
3. Relate to the history of Javascript including some background on Markup Languages (SGML, etc.)
4. Relate to JSP Presentation Oriented Publishing (POP) applications
5. Relate to PERL Message Oriented Middleware (MOM) applications
6. Relate to XML-Based Application Configuration.
7. Understand and describe Java-enabled technology
8. Highlight related technologies

**Unit I   - HTML, DHTML**

HTML : Overview of  HTML – Basic Concepts – HTML and Images – Lists- Formatting Tags –Links and Addressing – Tables – Frames –Layers –Styles Sheets – Forms –HTML and Media Types. DHTML – Object Model –HTML and Scripting access – CSS.

## Unit II - SCRIPTING LANGUAGES

Java Script : Introduction – Programming Fundamentals – Variables – Data Types – Statements- Functions and Objects – Navigator Object Model – Cookies. CGI &Perl : Concepts of CGI – Perl – Basics – Variables – Arrays – Controlling Program Flow – Perl Functions- File Handling – Database Connectivity.

## Unit III  -  XML

XML – XML Fundamentals –Creating XML Documents – Well Formed and Valid XML Documents –General Syntax – Components of  XML Documents – Elements, Attributes and Entities – XML Data Design – DTD – XML Schema- XSTL.

## Unit IV -SERVLETS AND JSP

Servlet Architecture Overview- Servlet Life cycle- Parameter Data – Sessions- Cookies – Data Storage –Servlet and Concurrency. JSP: Introduction – JSP and Servlets- Running JSP Applications – Basic JSP – Java Bean Classes and JSP – Tag Libraries and Files.

## Unit V -CASE STUDY

Develop Blogging application and transform the Blogging Application from a loose collection of various resources to an integrated web application.

## SUGGESTED READINGS

1. David Flanagan. (2014). Javascript: The Definitive Guide (6th ed.). O'Reilly Media.
2. Dave Mercer. (2012). ASP.NET – Beginner's Guide(2nd ed.). New Delhi: MCGraw Hill
3. Thau. (2008). The Book of JavaScript: A Practical Guide to Interactive WebPages.
4. Jeffrey C. Jackson. (2007). Web Technologies, Pearson Education, 1st Edition.
5. David Flanagan. (2006). Javascript: The Definitive Guide. O'Reilly Media.
6. Paul Wilton. (2005). Beginning JavaScript. 2nd  Edition. Wiley Dreamtech India(P) ltd, New Delhi.
7. Thomas A Powell. (2000).  The Complete SUGGESTED READINGSHTML, 2nd Edition, Tata McGraw Hill Publishing, New Delhi.
8. Rohit Khurana. (2000).  Java Script, APH Publishing Corporation. New Delhi.
9. Ivan BayRoss. (2000).  HTML, DHTML, Java Script, Perl CGI, BPB Publications, 1st Edition.

10. Sybex. (2001). XML Complete, BPB Publications, 1st Edition.

11. Deitel Nieto. (2000).World Wide Web. 3rd Edition, Pearson Education,  New Delhi.

**WEB SITES**

1. http://www.w3schools.com/js/default.asp

2. http://www.w3schools.com/xml/default.asp

3. www.amazon.com/web-server-technology

4. http://www.brics.dk/ixwt

**20RCS307          Paper – III: Special Paper VII: Software Engineering      4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To Understand detailed concepts related to software engineering life cycle
- To Gain knowledge about the concepts of software designing and testing
- To Acquire knowledge about an overview of object oriented analysis and design, modeling language.
- To acquire knowledge in software testing techniques.
- To make student understand the software quality insurance

**Course Outcomes(COs)**

1. Analyze and identify a suitable software development life cycle model for an application
2. Develop software requirements specification and cost estimation for an application
3. Differentiate the design models and testing techniques for implementing a software
4. Apply the object orientation concepts in software development
5. Apply the concept of object oriented methodologies and unified modeling language in software development

**Unit I - THE EVOLVING ROLE OF SOFTWARE**

Software - software crisis - software process model. Component based development: - The formal methods model – fourth generation techniques. Software Project Planning – Project Planning Objectives - Software Scope – Resources. System planning and initial investigation, bases for planning – Investigation

**Unit II - ANALYSIS CONCEPTS AND PRINCIPLES**

Requirement analysis principles – The Information domain – modeling – partitioning – Essential and implementation views. Software prototyping methods and tools. Specification: Specification principles – representation – software requirements specification.

**Unit III - DESIGN CONCEPTS AND PRINCIPLES**

The Design process: design and software quality – The Evolution of Software Design. Design principles:- Design concepts – effective modular design – the design model – design documentation – Software Architecture.

## Unit IV - SOFTWARE TESTING TECHNIQUES

Testing Techniques/Tools selection process – Selecting Techniques/tools – Structural System Testing techniques- Functional System Testing Techniques – Unit Testing Technique – Functional Testing and Analysis – Functional Testing – Test factor/Test Technique Matrix-The Cost of Computer Testing – Life Cycle Testing concept – Verification and validation in the software. Assess Project Management Development Estimate and Status - Develop Test Plan - Requirements Phase Testing -Design Phase Testing -Program Phase Testing

## Unit V - SOFTWARE QUALITY ASSURANCE

Case studies:  WinRunner – QTP ( Quick Test Professional)

## SUGGESTED READINGS

1. Pressman, R.S. (2009).   Software  Engineering: A  Practitioner's  Approach. 7th edition. McGraw-Hill, New Delhi.

2. Aggarwal, K.K., &  Singh, Y. (2008).  Software Engineering. 2nd  edition. New Age International Publishers.

3. Sommerville, I. (2007). Software Engineering. 8th edition. Addison Wesley. New Delhi.

4. Bell, D. (2005). Software Engineering for Students. 4th edition. Addison- Wesley, New Delhi.

5. Mall, R. (2004). Fundamentals of  Software  Engineering. 2nd  edition.   Prentice-Hall  of  India, New Delhi.

6. Richard Fairley. (1997). Software Engineering Concepts.  8th Edition. Tata McGraw Hill Publishing Company, New Delhi.

7.  Elias  M.  Awad.(1996). System  Analysis  and  Design. 2nd  Edition.  BPB Publication, New Delhi.

## WEB SITES

1. www.opensourcetesting.org
2. www.onestoptesting.com
3. www.cs.queensu.ca
4. www.ece.cmu.edu

**20RCS308          Paper – III: Special Paper VIII:  Cyber Security          4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To provides an overview of Information Security and Assurance.
- To provide an exposure to the spectrum of security activities methods methodologies and procedures with emphasis on practical aspects of Information Security.
- To provide the understanding in Cyber crime.
- To provide awareness of security in mobile devices.
- To understand the use of tools.

**Course Outcomes(COs)**

A student who successfully completes this course should at a minimum be able to:

1. State the basic concepts in information security
2. Explain concepts related to applied cryptography including the four techniques for crypto-analysis symmetric and asymmetric cryptography, digital signature, message authentication code, hash functions and modes of encryption operations.
3. Explain common vulnerabilities in computer programs including buffer overflow Vulnerabilities time-of-check to time-of-use flaws incomplete mediation.
4. To implement the security in mobile devices.
5. To understand the tools to reduce the cyber crime.

**Unit I - INTRODUCTION TO CYBERCRIME**

Definition and Information Security-who are cybercriminals? - Classification of cybercrimes. Cybercrime: The legal perspectives- cybercrimes: An Indian Perspective - cybercrime and the Indian ITA2000: Hacking and the Indian law(s) - A Global Perspective on cybercrimes: cybercrime and the Extended Enterprise - cybercrime Era: Survival Mantra for the Netizens - Concluding Remarks and Way Forward to Further Chapters.

**Unit II - CYBER OFFENSES**

How Criminals Plan Them: Introduction: categories of Cybercrime -How criminals Plan the Attacks: Reconnaissance Passive Attacks Active Attacks Scanning and Scrutinizing Gathered Information Attack(Gaining and Maintaining the system Access) -social Engineering:

Classification of Social Engineering – Cyber talking: Types of stalkers Cases Reported on Cyber stalking How stalking Works? real-life incident of  Cyber stalking -Cybercafe and Cybercrimes - Botnets: The Fuel for cybercrime: Botnet - Attack Vector-Cloud Computing: Why cloud computing? Types of Services Cybercrime and Cloud Computing.

## Unit III – CYBERCRIME

Mobile and wireless Devices-Introduction - Proliferation of Mobile and Wireless Devices - Trends in Mobility-Credit Card Frauds in Mobile and Wireless Computing Era: Types and Techniques of Credit Card Frauds - Security challenges Posed by Mobile  Devices - Registry Settings for Mobile Devices - Authentication Service security: cryptographic security LDAP Security RAS Security Media Player Control Security Networking API Security - Attacks on Mobile/Cell Phones: Mobile Phone Theft Mobile Viruses Mishing Vishing Smishing Hacking Bluetooth.

## Unit IV - MOBILE DEVICES

Security Implication for Organizations – Managing Diversity and Proliferation of Hand-Held Devices Unconventional/ Stealth Storage Devices Threats through Lost and Stolen Devices Protecting Data on lost devices Educating the Laptop Users - Organizational Measures for Handling Mobile devices - Related Security Issues: Encrypting Organization Databases Including Mobile Devices in Security Strategy -Organizational Security Policies and Measures in mobile Computing Era: Importance of Security polices relating to mobile Computing Devices Operating Guidelines for Implementing Mobile Devices Security Polices Organizational Policies for the Use of Mobile Hand - Held Devices - Laptops: Physical Security Countermeasures.

## Unit V - TOOLS AND METHODS USED IN CYBERCRIME

Introduction - Proxy Servers and Anonymizers - Phishing: How Phishing Works? - Password Cracking: Online Attacks Offline Attacks Strong Weak and Random Passwords Random passwords - Keyloggers and Spywares: Software Keyloggers Hardware Keyloggers Anti Keylogger Spywares - Virus and Worms: Types of Virus - Trojan Horses and Backdoors: backdoor How to protect from Trojan Horses and Backdoors - Steganography: Steganalysis - DoS and DDoS Attacks: DoS AttacksClassification of  DoS Attacks Types or Levels of DoS Attacks Tools Used to Launch DoS Attacks DDoS Attacks How to Protect from DoS/DDoS

Attacks – SQL Injection: Steps for SQL Injection Attacks How to Prevent SQL Injection Attacks - Buffer Overflow: Types of Buffer Overflow How to Minimize Buffer Overflow - Attacks on Wireless Networks: Traditional Techniques of Attacks on Wireless Networks Theft of Internet Hours and Wi-fi-based Frauds and Misuses How to Secure the Wireless Networks.

**SUGGESTED READINGS**

1.Nina Godbole & SUNIT Belapure. (2013). CYBER SECURITY. Wiley India Pvt. Ltd. New Delhi

2.Charles ,P. Pfleeger ,& Shari, L. Pfleeger. (2003).

3.Dieter Gollmann . (2006). Computer Security. 2nd edition. John Wiley & Sons.

4. Godbole, N. (2009). Information Systems Security: Metrics Frameworks and Best Practices. Wiley India. New Delhi

5.Marther, T., Kumaraswamy, S.,& Latif, S. (2009). Cloud Security and Privacy: An Enterprise Perceptive on Risk and Complaince. O'Reilly.

**WEB SITES**

1. http://www.csc.ncsu.edu/faculty/ning
2. csrc.nist.gov/publications/nistpubs/800-12/handbook.pdf
3. www2.warwick.ac.uk/fac/sci/dcs/teaching/modules/cs134/

**20RCS309          Paper – III: Special Paper IX: Mobile Computing          4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

- To understand mobile computer systems particularly in the context of wireless network systems such as 1G/2G/3G mobile telephony, data networks, and other wireless networks and infrastructure.
- To provide clear understanding of Wireless LANs and WML script concept.
- To make the student understand the working of mobile applications
- To understand the working of TCP
- To understand the security  in mobile IP

**Course Outcomes(COs)**

On successful completion of the course the student should be able to:

1. Describe wireless and mobile communications systems and be able to choose an appropriate mobile system from a set of requirements.
2. Be able to avoid or work around the weaknesses of mobile computing, or to reject mobile computing as a solution.
3. Program applications on a mobile computing system and interact with servers and database systems.
4. Understand about Wireless Internet Mobile IP and Wireless Web technology.
5. Implement and work on mobile application.

**UNIT I -  MEDIUM ACCESS CONTROL**

Motivation for Specialized MAC-SDMA-FDMA-TDMA-CDMA- Comparison of Access mechanism – telecommunication: GSM-DECT-TETRA-UMTS-IMT-200 - Satellite Systems :Basics – routing- Localization- Handover- Broadcast Systems : Overview _ Cyclic Repetition of Data- digital Audio Broadcasting - Digital Video Broadcasting

**UNIT II -  WIRELESS LAN**

Infrared Vs Radio Transmission – Infrastructure Networks- Ad Hoc Network- IEEE 802.11 – HIPERLAN- Bluetooth – Wireless ATM: Working Group- Services- References Model-

Function – Radio Access Layer – Handover- Location Management- Addressing Mobile Quality of Service- Access Point control Protocols

## UNIT III - MOBILE IP

Goals – Assumptions and Requirement –Entities- IP packet Delivery –Agent Advertisement and Discovery – Registration – Tunneling and encapsulation- Optimization –Reverse Tunneling- Ipv6- DHCP- Ad hoc Networks

## UNIT IV - TRADITIONAL TCP

Indirect TCP- Snooping TCP – Mobile TCP –Fast retransmit/ Fast Recovery- Transmission/timeout Freezing- Selective Retransmission – Transaction Oriented TCP

## UNIT V - WAP ARCHITECTURE

– Datagram protocol – Transport Layer Security – Transaction protocol- Session Protocol- application Environment – Wireless Telephony Application

## SUGGESTED READINGS

1.  Ashok, K.Talukder,& Roopa, R. Yavagal. (2008). Mobile Computing. Tata Mc-Graw Hill Publishing Company Pvt Ltd, New Delhi.
2.  Raj Kamal . (2011). Mobile Computing. Pearson Education. Tomasz Imielinski,
3.  Henry F. Korth . (2014). Mobile Computing. Springer , US.
4.  Mischa Schwartz. (2005). Mobile Wireless Communications. Cambridge University Press.
5.  J.Schiller. (2000). Mobile Communication, Addison Wesley.
3.  William Stallings. (2004). Wireless Communication and Networks, Pearson Education
4.   Singhal. (2003).  AP-Wireless, Application Protocol, Pearson Education.
5.   Lother Merk,Martin, S.Nicklaus and Thomas Stober. (2003). Principles of Mobile Computing, Second Edition,Springer.
6.  William C.Y.Lee. (1993). Mobile Communication Design Fundamentals, John Wiley.

**20RCS310            Paper – III: Special Paper X: Cloud Computing            4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0            Marks:  External:100  Total: 100**

**End Semester Exam : 3 Hours**

**Course Objectives**

To learn about the basic things involved in cloud computing and its architecture.

- To learn about the characteristics and types of cloud.

- To know about the services such as IaaS, PaaS, SaaS, IDaaS and CaaS.

- To understand the Virtualization Technologies.

- To understand the Information Security, Privacy and Compliance Risks.

- To learn commercial Google Web services – Open Nebula.


**Course Outcomes(COs)**

On successful completion of the course the student should be able to:

1. Understand cloud architecture and model.
2. Implement working of service models.
3. Explore cloud infrastructure.
4. Learn Threat issues and Database Integrity Issues.
5. Learn Open Source and Commercial Clouds such as Microsoft Azure, Amazon EC2.


**Unit I - INTRODUCTION TO CLOUD COMPUTING**

Characteristics of Cloud Computing -Paradigm shift - Benefits of cloud computing - Disadvantages of cloud computing- Role of Open Standards-Cloud Computing Architecture: Cloud computing stack-Public cloud -Private cloud -Hybrid cloud -Community cloud


**Unit II – SERVICE MODELS**

Infrastructure as a Service (IaaS) -Platform as a Service (PaaS) -Software as a Service (SaaS) -Identity as a Service (IDaaS) -Compliance as a Service (CaaS)- Cloud storage

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**Unit III- VIRTUALIZATION TECHNOLOGIES**

Load Balancing and Virtualization -Advanced load balancing -The Google cloud - Hypervisors -Virtual machine types -VMware vSphere - Machine Imaging -Porting Applications -The Simple Cloud API - AppZero Virtual Application Appliance

## Unit IV - CLOUD INFORMATION SECURITY OBJECTIVES

Confidentiality Integrity and Availability -Cloud Security Services - Relevant Cloud Security Design Principles -Cloud Computing Risk Issues -The CIA Triad Privacy and Compliance Risks -Threats to Infrastructure Data and Access Control -Cloud Access Control Issues - Database Integrity Issues -Cloud Service Provider Risks Architectural Considerations

## Unit V – HOW TO MOVE APPLICATION INTO THE CLOUD

Web Application Design- Machine Image Design-privacy design –Database management-Specialized cloud Architecture:Workload distribution architecture-Dynamic scalability-Cloud bursting-hypervisor clustering-service quality metrics & SLA.

## SUGGESTED READINGS

1. BarrieSosinsky .(2010). Cloud Computing Bible .Wiley- India.New Delhi:
2. Rajkumar Buyya, James Broberg, & Andrzej, M. Goscinski. (2011). New Delhi: Tata Mc-Graw Hill.
3. Ronald, L. Krutz, Russell Dean Vines. (2010). Cloud Security: A Comprehensive Guide to Secure Cloud Computing. New Delhi: Wiley –India
4. Dr Kumar Saurabh.(2012). Cloud Computing ($2^{nd}$ ed.). New Delhi: Wiley India.
1. Anthony T.Velte Toby J.Velte Robert Elsenpeter. (2010). Cloud Computing Practical Approach ($1^{st}$ ed.). New Delhi:Tata McGraw Hill.
2. Nikos Antonopoulos, Lee Gillam. (2012). Cloud Computing: Principles Systems and Applications . Springer.
3. Giovanni Toraldo. (2012). Open Nebula 3 Cloud Computing.

## WEB SITES

1. en.wikipedia.org/wiki/Cloud_computing
2. www.ibm.com/cloud-computing/in/en/
3. www.oracle.com/CloudComputing
4. www.microsoft.com/en-us/cloud/default.aspx

**20RCS311          Paper – III: Special Paper XI: Internet of Things          4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0           Marks:  External:100  Total: 100**

**End Semester Exam : 3**

**Course Objectives**

- To Understand the Introduction to IoT and Architectural Overview of IoT
- To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)
- To Understand the communication technologies in IoT
- To Know the IoT protocols and web of things
- To  Know the various applications of IoT

**Course Outcomes(COs)**

A student who successfully completes this course should at a minimum be able to:

1. Understand building blocks of Internet of Things and characteristics.
2. Understand IoT protocols, Web of Things and Integrating IOT.
3. Understand the application areas of IOT ·
4. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
5. Learn about communication technologies used in IoT, Web of Things, Structural models and applications of IoT.

**Unit I – OVERVIEW**

IoT-An Architectural Overview– Building an architecture-Main design principle and needed capabilities-An IoT architecture outline- standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways- Local and wide area networking- Data management-Business processes in IoT-Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management

**Unit II - IOT PROTOCOLS**

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – point-to-point protocols - Ethernet protocols - cellular Internet access protocal - Machine-to-machine protocol - ModbusWirelessHART-ZWave-Bluetooth

Low Energy, DASH7  – KNX – Zigbee Architecture – Network layer – APS layer – Security- Threats to IOT system.

## Unit III - WEB OF THINGS

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.

## Unit IV - INTEGRATING IoT

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon.

## Unit V – Applications

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging - Case studies: Sensor body-area-network and Control of a smart home.

## SUGGESTED READINGS

1. HonboZhou . (2012). The Internet of Things in the Cloud:A Middleware Perspective-–CRC Press .
2. - Dieter Uckelmann; Mark Harrison; Florian Michahelles- (Eds.).(2011). Architecting the Internet of Things– Springer.
3. David Easley and Jon Kleinberg . (2010). Networks, Crowds, and Markets: Reasoning About a Highly Connected World ,CambridgeUniversity Press.
4. Olivier Hersent, Omar Elloumi and David Boswarthick . (2012). The Internet of Things: Applications to the Smart Grid and Building Automation . Wiley.
5. Olivier Hersent, David Boswarthick, Omar Elloumi. (2012). The Internet of Things – Key applications and Protocols.  Wiley.

**WEB SITES**

1.  https://www.ibm.com/blogs/internet-of-things/what-is-the-iot
2.  https://www.i-scoop.eu/internet-of-things-guide
3.  https://iot-analytics.com
4.  https://www.elsevier.com/books/internet-of-things/tsiatsis/

**20RCS312          Paper – III: Special Paper XII: Artificial Intelligence          4H – 4C**

**Instruction Hours / week: L: 4 T: 0 P: 0          Marks:  External:100  Total: 100**

**End Semester Exam : 3**

**Course Objectives**

- To know about the problem solving and AI
- To learn search methods and expert systems
- To enable the student to be familiar with AI theorems and algorithms
- To enables the students to understand the graph notations and search methods
- To gain knowledge in Acquisition
- To learn Automatic  program writing with expert systems.

**Course Outcomes(COs)**

On successful completion of the course the student should be

1. Able to understand the problem states and AI
2. Able to understand state space methods
3. Able to understand problem reduction search methods and predicate calculus
4. Understand the search algorithms  and its measures
5. Able to knowledge engineer in expert systems

**Unit I - PROBLEM SOLVING AND AI**

Puzzles and Games – Problem States and operators-problem solving Agents – Heuristic programming – state space representations – state descriptions-searching for solutions – graph notations – non- deterministic programs — Uninformed search strategies.

**Unit II - STATE SPACE SEARCH METHODS**

Breadth first and depth first search – heuristic – admissibility- Local search algorithms and Optimization problems – optimality of algorithms – Searching with Non Deterministic Actions- Searching  with partial observations – performance measures – problem reduction representations – AND/OR graphs and higher-level state space

**Unit III - PROBLEM REDUCTION SEARCH METHODS**

Cost of solution trees – ordered search – alpha beta and minimum procedure-alpha beta pruning -Imperfect  Real time  Decisions-Stochastic Games – theorem proving in predicate calculus – syntax, semantics, Herbrand universe: variables, qualifiers, unification, resolvents

## Unit IV - PREDICATE CALCULUS IN PROBLEM SOLVING& AGENTS

Answer extraction process – resolution – Automatic program writing – predicate calculus – proof finding methods – Logical Agents – Knowledge Based Agents – the Wumpus world – propositional Logic – agents based on propositional logic

## Unit V - EXPERT SYSTEMS

Expert systems and conventional programs – expert system organization – Knowledge engineering: knowledge representation techniques – knowledge acquisition – acquiring knowledge from experts – automating knowledge acquisition –Building an expert system – difficulties in developing an expert system

## SUGGESTED READINGS

1.Chandra .S.S.V. (2014). Artificial Intelligence and Machine Learning. Kindle Edition.

2. Dr.R.P.Das. (2012). Neural Networks and Fuzzy Logic. 1$^{st}$Edition, Tata Mcgraw Hill, Delhi

3. Flasiński, Mariusz. (2016). Introduction to Artificial Intelligence. Tata Mcgraw Hill, Delhi.

4. E Charnail, CK Reiesbeck and D V Medermett. (2011).Artificial Intelligence Programming, Lawrence Erlbaum Associates, N J.

6.  N J Nilson. (2013). Principles of Artificial Intelligence , Tiega Press, Polo Alto.

7.  Elain Rich and Kevin Knight. (2015). Artificial Intelligence.  McGraw Hill.

8.  Donald A Waterman. (2011). A Guide to Expert Systems, Tech knowledge series in knowledge engineering.

## WEB SITES

1.  https://www.tutorialspoint.com › Artificial Intelligence

2.  www-formal.stanford.edu/jmc/whatisai/node3.html

3.  http://aima.cs.berkeley.edu/contents.html

4.  http://Artificial-Intelligence-3e-Modern-Approach/ contents.html