MANONMANIAM SUNDARANAR UNIVERSITY

TIRUNELVELI – 12.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

M.Phil., (Computer Science) – (CBCS)

For Affiliated Colleges - From the Academic Year – (2018-2019)

S.No	Sem	Subject	Credits	Hours Per Week
1	I	Research and Teaching Methodology	4	4
2		Recent Research Topics in Computing	4	4
3		Elective - I	4	4
4	II	Dissertation	12	
		Total No. of Credits	24	

List of Electives Offered:

1. Internet of Things (IoT)
2. Advanced Digital Image Processing
3. Data Mining and Warehousing
4. Machine Learning Techniques
5. Cloud Computing

CORE: I - RESEARCH AND TEACHING METHODOLOGY

L T P C
4 0 0 4

***OBJECTIVES* :**

- To understand the importance of Research Methodology
- To ensure the reliability and validity of experiments
- To perform exploratory data analysis
- To apply the statistical testing to prove the hypothesis
- To provide the inference using quantitative data analysis
- To make use of computer aids to analyze the data, prepare reports and presentations
- Able to evaluate methodology of teaching

UNIT - I

12(10L+2S)

INTRODUCTION OF RESEARCH AND FORMULATION

Motivation and Objectives – Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – Reviews, treatise, monographs, patents –Critical literature review .

RESEARCH DESIGN AND METHODS

Research design – Basic Principles- Need of research design –– Features of good design – Important concepts relating to research design.

UNIT- II

12(10L+2S)

Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models - Developing a research plan - Exploration, Description, Diagnosis, Experimentation - Determining experimental and sample designs.

DATA COLLECTION

Execution of the research - Observation and Collection of data - Methods of data collection.

UNIT- III

12(10L+2S)

DATA ANALYSIS

Quantitative Methods: Online Quantitative Design and Survey – Descriptive Measures – Probability – Random Variables and Distribution Functions – Discrete Probability Distributions – Continuous Probability Distribution – Sampling Distributions – Theory of Estimation – Hypothesis Testing – Correlation – Regression – Principles of Sample Survey – Types of Sampling – Design of Experiments – CRD-RBD-LSD-Factor Analysis – Cluster Analysis –Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical Software Packages.

REPORTING AND THESIS WRITING

Reporting and thesis writing – Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes – Use of Oral presentation – Software Packages for thesis Preparation– Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective communication.

UNIT-IV

12(10L+2S)

APPLICATION OF RESULTS AND ETHICS

Application of results and ethics - Environmental impacts - Ethical issues - ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism – Application of Plagiarism detection tools - Citation and acknowledgement - Reproducibility and accountability.

UNIT V

12(10L+2S)

METHODOLOGY OF TEACHING

Teaching – Objectives of Teaching, Phases of Teaching – Teaching Methods: Lecture Method, Discussion Method, Discovery Learning, Inquiry, Problem Solving Method, Project method, Seminar – Integrating ICT in Teaching: Individualised Instruction, Ways for Effective Presentation with PowerPoint – Documentation – Evaluation: Formative, Summative & Continuous and Comprehensive Evaluation – Later Adolescent Psychology: Meaning, Physical, Cognitive, Emotional, Social and Moral Development – Teaching Later Adolescents.

TOTAL: 60 PERIODS
(L- Lecture : S – Seminar)

OUTCOMES:

- Explain the importance of the research methodology
- To validate the reliability
- Select and apply different research approaches and methodologies
- Develop data collection instrument according to the underlying theoretical framework.
- Analyse quantitative data and qualitative data using software packages
- Provide valid inference
- Construct and document an appropriate research design
- Discuss limitations and potential contribution to theory and practice of research
- Effectively apply the appropriate computer tools in each stage of research
- Ability to implement effective ICT based Teaching Methods

REFERENCES

1. C R Kothari, Paperback "Research Methodology: Methods and Techniques", 2014
2. Modern Language Association Handbook, Eight Edition, 2016
3. R. Paneerselvam, "Research Methodology" 2nd Edition, PHI, 2014
4. John W Creswel, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3rd Edition, 2014
5. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi, 2014 Edition.
6. S.C. Gupta & V.K. Kapoor, Fundamentals of Applied Statistics, Sultan Chand & Sons. 2014 Edition.
7. Sampath.K, Panneerselvam.A & Santhanam.S (1984), Introduction to Educational Technology (2nd Revised Ed.) New Delhi: Sterling Publishers.
8. Sharma.S.R(2003).Effective Classroom teaching modern methods, tools & techniques, Jaipur: Mangal Deep.
9. Vedanayagam.E.G (1989). Teaching Technology for College Teachers, Newyark: SterlingPublishers.

CORE: II - RECENT RESEARCH TOPICS IN COMPUTING

L T P C

4 0 0 4

***OBJECTIVES*:**

- To apply AI techniques primarily for machine learning, vision, and robotics.
- To understand the fundamentals of Internet of Things
- To study about virtualization and cloud resource management
- To model and visualize the social network
- To introduce visual perception and core skills for visual analysis
- Learn developmental and artificial immune systems
- To get exposed to the domain of bioinformatics
- To know about various applications of natural language processing
- Understand behavioural systems especially in the context of Robotics

UNIT I SOFT COMPUTING **12(10 L +2 S)**

Introduction of soft computing - soft computing vs. hard computing- various types of soft computing techniques- applications of soft computing-Neuron- Nerve structure and synapse Artificial Neuron and its model- activation functions- Neural network architecture- single layer and multilayer feed forward networks- McCullochPitts neuron model- Perceptron model- Adeline and Madeline- multilayer perception model- back propagation learning methods- effect of learning rule coefficient -back propagation algorithm- factors affecting back propagation training applications. Introduction to Deep Learning.

UNIT II

12(10 L + 2 S)

CLOUD ARCHITECTURE AND INTERNET OF THINGS

Introduction: Cloud delivery model, Cloud Storage Architectures, Software as a Service (SaaS): SaaS service providers – Google App Engine, Salesforce.com and googleplatfrom – Benefits – Operational benefits - Economic benefits – Evaluating SaaS – Platform as a Service (PaaS): PaaS service providers – Right Scale – Salesforce.com – Rackspace – Force.com – Services and Benefits – Infrastructure-as-a -Service (IaaS): IaaS Service Providers – Amazon EC2 – GoGrid.

Introduction to Distributed Computing: architectural models - fundamental models - P2P systems - Introduction to inter process communications - external data representation and marshalling- client server communication - group communication-multicast/pubsub - Energy Efficient Computing - Cloud computing.

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The

Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.

UNIT III BIG DATA AND VIRTUALIZATION

12(10 L + 2 S)

Big Data - Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – Cloud databases - S3 - Hadoop Distributed File Systems – Visualizations - Visual Data Analysis Techniques - Interaction Techniques – Social Network Analysis – Collective Inferencing – Egonets - Systems and Applications

Linux System- Basic Concepts ;System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting Up Local Network Services; Virtualization- Basic Concepts, Setting Up Xen,VMware on Linux Host and Adding Guest OS.

UNIT IV

12(10 L + 2 S)

BIO INSPIRED COMPUTING AND BIO INFORMATICS

Introduction of Foundations of evolutionary theory – Genotype – artificial evolution – genetic representations – initial population – fitness functions – selection and reproduction – genetic operators – evolutionary measures – evolutionary algorithms – evolutionary electronics – evolutionary algorithm case study Cellular systems – cellular automata – modeling with cellular systems – other cellular systems – computation with cellular systems – artificial life – analysis and synthesis of cellular systems

Need for Bioinformatics technologies – Overview of Bioinformatics technologies – Structural bioinformatics – Data format and processing – secondary resources-Applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT V

12(10 L + 2 S)

NATURAL LANGUAGE PROCESSING AND ROBOTICS

Natural Language Processing – Mathematical Foundations – Elementary Probability Theory – Essential information Theory - Linguistics Essentials - Parts of Speech and Morphology – Phrase Structure – Semantics – Corpus Based Work

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots

Tool Maker's microscope - Co-ordinate measuring machines - Universal measuring machine - Laser viewers for production profile checks - Image shearing microscope - Use of computers - Machine vision technology - Microprocessors in metrology.

TOTAL: 60 PERIODS

OUTCOMES:

- Provides a basic exposition to the goals and methods of Artificial Intelligence.
- Design a portable IoT using Arduino/ equivalent boards and relevant protocols
- To implement virtualization and cloud resource management
- Predict the possible next outcome of the social network
- Explain principles of visual perception

REFERENCES:

1. S.N.Sivanandam ,S.N.Deepa" Principles of Soft Computing", Wiley-India,2007.
2. Arshdeep Bahga,vijay Madisetti,"Internet Of Things –A hands-on approach",Universities Press-2015.
3. kevin P.Murphy,"Machine learning:A probabilistic perspective ".MIT press,2012.
4. Charu C.Aggarwal,"Social Network Data Analytics"Springer,2011
5. Evan Stubbs,"The value of business analtics:Identifying the path to profitability",Wiley,2011.
6. A.E Elben and J.E Smith,"Introduction to Evolutionary computing ",Springer,2010

Elective Papers

PAPER – 1 - INTERNET OF THINGS (IoT)

L T P C
4 0 0 4

OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario

UNIT I INTRODUCTION TO IoT

12(10L+2S)

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE

12(10L+2S)

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture

UNIT III IoT PROTOCOLS

12(10L+2S)

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO **12(10L+2S)**

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks - Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces - Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS

12(10L+2S)

Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT– Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.

TOTAL PERIODS: 60

OUTCOMES:

- Upon completion of this course, the students should be able to:
- Analyze various protocols for IoT
- Develop web services to access/control IoT devices.
- Design a portable IoT using Rasperry Pi
- Deploy an IoT application and connect to the cloud.
- Analyze applications of IoT in real time scenario

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.
3. Honbo Zhou, ―The Internet of Things in the Cloud: A Middleware Perspective‖, CRCPress, 2012.
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols‖, Wiley, 2012

PAPER 2 - ADVANCED DIGITAL IMAGE PROCESSING

L T P C

4 0 0 4

OBJECTIVES:

- To understand the image fundamentals and mathematical transforms necessary for image. Processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.
- To introduce the concepts of image registration and image fusion.
- To analyze the constraints in image processing when dealing with 3D datasets.

UNIT I

12 (10 L+2S)

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing

UNIT II

12 (10 L+2S)

SEGMENTATION

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods-Level set method, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods

UNIT III

12 (10 L+2S)

FEATURE EXTRACTION

First and second order edge detection operators, Phase congruency, Localized feature extraction-detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Runlength features, Fractal model based features, Gabor filter, wavelet features

UNIT IV

12 (10 L+2S)

REGISTRATION AND IMAGE FUSION

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, region matching Template matching .Transformation functions-Similarity transformationand Affine Transformation. Resampling- Nearest Neighbour and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusiondiscrete wavelet transform, Curvelet transform. Region based fusion.

UNIT V

12 (10 L+2S)

3D IMAGE VISUALIZATION

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

TOTAL: 60 PERIODS

OUTCOMES:

- To apply image processing techniques in both the spatial and frequency domains.
- To design image analysis techniques in the form of image segmentation and to evaluate the methodologies for segmentation.

TEXT BOOK:

1. John C.Russ, "The Image Processing Handbook", CRC Press,2007.
2. Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", Academic Press, 2008.
3. Ardeshir Goshtasby, " 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications",John Wiley and Sons,2005.
4. H.B.Mitchell, "Image Fusion Theories, Techniques and Applications", Springer,2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson Education, Inc., 2002.
3. Rick S.Blum, Zheng Liu," Multisensor image fusion and its Applications",Taylor& Francis,2006. Faulty of I and C Engg (Approved in 16th AC(Ad hoc) 02.12.2010) ITEM NO. FI 16.01(10)

Paper – 3 DATA MINING AND WAREHOUSING

L T P C
4 0 0 4

Objectives:

- This course will introduce the concepts, techniques, design and applications of data warehousing and data mining.
- Learning Outcome and End use:
- Appreciate the strengths and limitations of various data mining and data warehousing models.
- Describe and utilize a range of techniques for designing data warehousing and data mining systems for real-world applications.

Unit I :

12(10L+2S)

DATA MINING: Motivation -Steps in Data Mining – Architecture - Data Mining and Databases – Data Warehouses – Data Mining functionalities – Classification – Data Mining Primitives – Major issues. DATA PREPROCESSING: Descriptive data summarization -Data Cleaning – Data integration and transformation – Data Reduction– Data discretization and concept hierarchy generation.

Unit II:

12(10L+2S)

DATA WAREHOUSE and OLAP TECHNOLOGY: Need for Data Warehouse- multidimensional data model- Data Warehouse architecture - Data Warehousing to Data mining. MINING FREQUENT PATTERNS, ASSOCIATIONS AND CORRELATIONS: Frequent itemsets, Association rules – Efficient and Scalable frequent itemset mining methods – mining various kinds of Association rules.

Unit III:

12(10L+2S)

CLASSIFICATION AND PREDICTION: Issues regarding classification and prediction – Classification by Decision Tree induction –Bayesian Classification – Rule based classification – Classification using Neural Networks Prediction – Accuracy and error measures – Evaluating the accuracy of classifiers and predictors.

Unit IV:

12(10L+2S)

CLUSTER ANALYSIS: Types of data – Partitioning Methods: k means and k Medoids – Hierarchical Methods: Agglomerative and Divisive hierarchical clustering- Outlier analysis.

Unit V:

12(10L+2S)

MINING TIME SERIES, SEQUENCE DATA: Trend analysis – similarity search – sequence patterns in transactional databases sequential pattern mining: concepts and primitives. MINING TEXT, MULTIMEDIA AND THE WORLD

WIDE WEB: Text data analysis and information retrieval- Dimensionality reduction for text – text mining approaches – similarity search in multimedia data – classification and prediction analysis -mining the web page layout structure – mining multimedia data on the web- web usage minin

TOTAL: 60 PERIODS

OUTCOMES:

- interpret the contribution of data warehousing and data mining to the decision-support level of organizations
- evaluate different models used for OLAP and data preprocessing
- categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis

REFERENCES:

1. HanJiawei, Micheline Kamber and Jian Pei "Data Mining: Concepts and Techniques", Morgan Kaufmann, 2011.
2. Soman K P, ShyamDiwakar and Ajay V, "Insight into Data Mining Theory and Practice", PHI Learning, 2009.
3. Arun K Pujari, "Data Mining Techniques", University Press, 2013.

PAPER – 4 - MACHINE LEARNING TECHNIQUES

L T P C
4 0 0 4

Objectives:
To prepare the students to understand and learn the machine learning techniques and to apply them for the practical problems.

UNIT I

12(10L+2S)

FOUNDATIONS OF LEARNING Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation generalization tradeoff – bias and variance – learning curve 3

UNIT II

12(10L+2S)

LINEAR MODELS Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – going beyond linearity – generalization and overfitting – regularization – validation

UNIT III

12(10L+2S)

DISTANCE-BASED MODELS Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning

UNIT IV **12(10 L+2S)**

TREE AND RULE MODELS Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning

UNIT V

12(10L + 2S)

REINFORCEMENT LEARNING Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal-difference learning – active reinforcement learning – exploration – learning an actionutility function – Generalization in reinforcement learning – policy search – applications in game playing – applications in robot control

TOTAL PERIODS: 60

OUTCOMES:

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

- Describe the various machine learning concepts and models.
- Apply the concepts for the practical problems.
- Compare and analyse the performance of various machine learning algorithms.

REFERENCES:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, "Learning from Data", AMLBook Publishers, 2012.
2. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
3. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
5. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.
7. T. M. Mitchell, "Machine Learning", McGraw Hill, 1997.
8. S. Russel and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2009
9. Peter Flach,"Machine Learning",Cambridge University Press,2015.
10. Shai Shalar-Schwartz & Shai Ben-David,"Understand Machine Learning,Cambridge University,2015.

PAPER – 5 CLOUD COMPUTING

L T P C
4 0 0 4

Objectives:

To prepare the students to understand and learn the machine learning techniques and to apply them for the practical problems.

Unit I

12(10L+2S)

Distributed System Models and Enabling Technologies: Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency

Computer Clusters for Scalable Parallel Computing: Clustering for Massive Parallelism, Computer Clusters and MPP Architectures, Design Principles of Computer Clusters, Cluster Job ad Resource Management

Unit II

12(10L+2S)

Cloud Platform Architecture over Virtualized Data Centers: Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms GAE, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management

Unit III

12(10L+2S)

Service-Oriented Architectures for Distributed Computing: Services and Service-Oriented Architecture, Message-Oriented Middle-ware, Portals and Science Gateways, Discovery, Registries, Metadata and Databases, Work-flow in Service-Oriented Architectures.

Unit IV

12(10L+2S)

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Unit V

12(10L+2S)

Ubiquitous Clouds and the Internet of Things: Cloud Trends in Supporting Ubiquitous Computing, Performance of Distributed Systems and the Cloud, Enabling Technologies for the Internet of Things, Innovative Applications of the Internet of Things, On-line Social and Professional Networking

TOTAL PERIODS: 60

OUTCOMES:

- Completing this course should provide you with a good understanding of **cloud computing.**
- A systematic knowledge of the fundamental technologies, architecture, and security. ... Identify problems.
- Explain, analyze, and evaluate various **cloud computing** solutions.

REFERENCES:

1. Distributed and Cloud Computing- Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra –Elsevier-2012
2. Cloud Computing – A Hands-on Approach – Arshdeep Bahga, Vijay Madisetti – University Press2014
3. Enterprise Cloud Computing – Gautam Shroff – Cambridge University Press – 2014.