B.S. Abdur Rahman Crescent Institute of Science & Technology

Deemed to be University u/s 3 of the UGC Act, 1956

REGULATIONS 2016

CURRICULUM AND SYLLABI

M. Tech.

INFORMATION TECHNOLOGY

UNIVERSITY VISION AND MISSION

VISION

B.S. Abdur Rahman Institute of Science and Technology aspires to be a leader in Education, Training and Research in Engineering, Science, Technology and Management and to play a vital role in the socio-Economic progress of the Country.

MISSION

- To blossom into an internationally renowned University
- To empower the youth through quality education and to provide professional leadership
- To achieve excellence in all its endeavors to face global challenges
- To provide excellent teaching and research ambience
- To network with global institutions of excellence, Business, Industry and Research Organizations
- To contribute to the knowledge base through scientific enquiry, Applied research and Innovation

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION AND MISSION

VISION

- To be a leader in providing quality education and training in the field of Information Technology at Undergraduate and Postgraduate levels and undertake Research activities thereby contributing to the progress of the country.

MISSION

- To impart quality education and inculcate professionalism to suit the needs of the industries and society.
- To involve graduates in undertaking need based Research activities and disseminate the knowledge to develop entrepreneurial skills.
- To improve the professionalism through extension activities, industrial visits and in-plant training.
- To improve communicate effectively both in documentation and presentation.
- To create awareness of social, economic responsibilities ethically.

PROGRAMME EDUCATIONAL OBJECTIVES & PROGRAMME OUTCOMES

M.Tech. (INFORMATION TECHNOLOGY)

PROGRAMME EDUCATIONAL OBJECTIVES

- To impart broad spectrum of knowledge and skill in the analysis, design, implementation and testing of software systems.
- To focus on need based research in different domains relevant to Information Technology and carry out research projects of national and social relevance.
- To provide problem solving capability through IT tools and techniques with adequate hands on experience to meet industry/ societal needs.
- To develop communication, problem solving, team spirit and leadership skills for a successful professional career.

PROGRAMME OUTCOMES

On completion of the programme students will be able to:

- Analyze, design, test and implement software systems required for IT industry.
- Apply relevant tools and techniques to solve software problems and undertake research activities.
- Prepare necessary software documentation and present with effective communication skills.
- Manage, organize and lead a team of highly competent Information technologists.

B.S.ABDUR RAHMAN UNIVERSITY

DEPARTMENT OF INFORMATION TECHNOLOGY

Curriculum – 2016

M.Tech. INFORMATION TECHNOLOGY

SEMESTER I

S. No	Course Code	Course	L	T	P	C
1.	ITC6101	Computer Forensics and Information Security	3	0	0	3
2.	CSC6101	Advanced Computer Architecture	3	1	0	4
3.	MAC6181	Applied Algebra and Discrete Algorithms	3	1	0	4
4.	ITC6102	Advanced Data Structures	3	0	2	4
5.	CSC6103	Computer Networks and Management	2	0	2	3
6.	ITC6103	Software Development Methodologies	2	0	0	2
7.	ITC6104	Industry Oriented Case Study	0	0	2	1

Total Credits: 21

SEMESTER II

S. No	Course Code	Course	L	T	P	C
1.	ITC6201	Cloud Computing Technologies	3	0	0	3
2.	GEC6201	Research Methodology for Engineers	3	0	0	3
3.		Professional Electives #	9	0	0	9
4.	ITC6202	Mobile Application Development	1	0	2	2
5.	ITC6203	Software Development and Testing Lab	0	0	2	1

Total Credits: 18

SEMESTER III

S. No	Course Code	Course	L	T	P	C
1	ITC7101	Project - Phase I	0	0	12	6*
2	ITC7102	Internet of Things	3	0	0	3
3		Professional Electives[# #]	9	0	0	9
4		General Elective[###]	3	0	0	3

Total Credits: 15

SEMESTER IV

S. No	Course Code	Course	L	T	P	C
1	ITC7101	Project - Phase II	0	0	36	18

Total Credits: 6 + 18 = 24

Total Credits: 78

*****Credits for Project Work – Phase I to be accounted along with Project Work – Phase II in IV Semester

[#] - Student has to take a minimum of 9 credits from the list of II semester Professional Electives.

[##] - Student has to take a minimum of 9 credits from the list of III semester Professional Electives.

[###] - Student has to take a minimum of 3 credits from the list of General Electives.

SEMESTER II PROFESSIONAL ELECTIVES

S. No	Course Code	Course	L	T	P	C
1.	ITCY201	Multicore Programming	3	0	0	3
2.	ITCY202	Software Requirements Management	3	0	0	3
3.	ITCY203	Social Network Analysis	3	0	0	3
4.	ITCY204	Multimedia Technology & Applications	3	0	0	3
5.	ITCY205	Distributed Systems	3	0	0	3
6.	ITCY206	IT Infrastructure Management	3	0	0	3
7.	ITCY207	Applied Cryptography	3	0	0	3
8.	ITCY208	Video Processing	3	0	0	3
9.	ITCY209	High Speed Networks	3	0	0	3
10.	CSCY01	Mobile Computing	3	0	0	3
11.	CSCY10	Advanced Databases	3	0	0	3
12.	CSCY54	Service Oriented Architecture	3	0	0	3
13.	ITCY210	Virtualization Techniques	2	0	0	2
14.	ITCY211	Programming with Hadoop	0	0	2	1

SEMESTER III PROFESSIONAL ELECTIVES

S. No	Course Code	Course	L	T	P	C
1.	ITCY101	Machine Learning	3	0	0	3
2.	ITCY102	Wireless Networks	3	0	0	3
3.	ITCY103	Enterprise Resource Planning	3	0	0	3
4.	ITCY104	Web Design & Management	3	0	0	3
5.	ITCY105	Design Patterns	3	0	0	3
6.	ITCY106	Data Warehousing and Data Mining	3	0	0	3
7.	ITCY107	Wireless & Mobile Communication	3	0	0	3
8.	ITCY108	Software Metrics	3	0	0	3
9.	ITCY109	Security in Big Data	3	0	0	3
10.	ITCY110	Multimedia Communication and Networks	3	0	0	3
11.	ITCY111	Adhoc and Sensor Networks	3	0	0	3
12.	ITCY112	Ontology and Semantic Web	3	0	0	3
13.	ITCY113	Software Project Management	3	0	0	3
14.	ECCY001	Digital Image Processing	3	0	0	3
15.	ITCY114	Human Computer Interface	2	0	0	2
16.	ITCY115	Data Science Analytics	2	0	0	2
17.	ITCY116	Big Data Analytics Tool	1	0	0	1
18.	ITCY117	Green Technology	1	0	0	1
19.	ITCY118	Blockchain Architecture and Use Cases	3	0	0	3
20.	ITCY119	Big Data Analytics for IoT	3	0	0	3

SEMESTER I

ITC6101	COMPUTER FORENSICS AND INFORMATION SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To have a fundamental understanding of security techniques.
- To apply appropriate skills and knowledge to identify and solve security issues in network.
- To apply theoretical and practical knowledge to provide security for operating systems and database.
- To understand the basics of computer forensics.
- To apply theoretical and practical knowledge in computer forensics for investigation.

MODULE I CRYPTOGRAPHY **9**

Security problem in computing – Elementary Cryptography – Symmetric Key Encryption Public Key Encryption – Uses of Encryption.

MODULE II PROGRAM & NETWORK SECURITY **9**

Security Programs – Non-malicious program Errors – Virus and other Malicious Code – Targeted Malicious Code – Control against program threats - Threats in Networks – Network Security Controls – firewalls – Intrusion Detection Systems – Secure E-Mail.

MODULE III OPERATING SYSTEM AND DATABASE **9**

Memory and Address Protection – File Protection Mechanisms – User Authentication – Trusted Operating Systems – Designing Trusted Operating Systems - Database Security Requirements – Multilevel Databases andMultilevel Security.

MODULE IV INTRODUCTION TO COMPUTER FORENSICS **9**

History of Forensics – Computer Forensic Flaws and Risks – Rules of Computer Forensics – Legal issues – Digital Forensic Principles – Digital Environments – Digital Forensic Methodologies - Forensics Software and Hardware tools.

MODULE V AN OVERVIEW OF COMPUTER FORENSICS INVESTIGATION **9**

Router Forensics and Network Forensics – An overview of Routers – Hacking Routers – Investigating Routers – Investigating Wireless Attacks – Basics of wireless – Wireless Penetration Testing – Direct Connections to Wireless Access Point – Wireless Connect to a

Wireless Access Point.

Total Hours : 45

REFERENCES:

1. Charles B. Pfleeger, Shari Lawrence Pfleeger, Fourth Edition, “Security in Computing”, Pearson Education, 2006.

2. William Stallings, “Cryptography and Network Security – Principles and Practices”, Sixth Edition, Pearson Education 2013.

3. Anthony Reyes, Jack Wiles, “Cybercrime and Digital Forenscis”, Elseiver Publications, 2007.

4. John Sammons, “The Basics of Digital Forensics”, Elesvier 2012.

5. Linda Volonins, Reynalds Anzaldua, “Computer Forensics for dummies”, WileyPublishing 2008.

OUTCOMES:

On completion of the course students will be able to :

- Have a fundamental understanding of cryptographic techniques.
- Display their competence in choosing securing mechanisms to protect the networks from threats.
- Apply security techniques to protect operating systems and databases.
- Have a fundamental understanding of computer forensics.
- Perform computer forensic investigation in an organization.

CSC6101 ADVANCED COMPUTER ARCHITECTURE

L	T	P	C
3	1	0	4

OBJECTIVES :

- To understand the functional requirements and their role in the system design
- To understand the various parameters that contribute to the performance of a computer system and the technology of achieving the best performance through these parameters
- To acquire essential knowledge to measure or predict system performance
- To understand how the memory hierarchy and optimization contribute to the performance of the system
- To understand the approaches in designing a new system through Instruction level parallel processing and to improve the Performance overcoming the hazards-meeting the functionality.
- To understand the data level parallel processing and Vector Processing for performance

MODULE I FUNDAMENTALS OF COMPUTER DESIGN 9+4

Functional Requirements and architecture - Measuring and reporting performance - Quantitative principles of computer design - Classifying instruction set architecture - Operands and operations for media and signal processing –Graphic processing - Encoding an instruction set - Example architecture - MIPS and TM32.

MODULE II MEMORY HIERARCHY DESIGN 9+3

Memory Hierarchy - Cache performance - Reducing cache miss penalty and miss rate - Reducing hit time - Main memory and performance - Memory technology and optimization-Virtual memory and Virtual Machine and protection.

MODULE III INSTRUCTION LEVEL PARALLELISM 9+3

Concepts of ILP - Pipelining and hazards –Compiler techniques for exposing ILP- Dynamic scheduling - Dynamic hardware prediction - Multiple issues - Hardware based speculation - Limitations of ILP - Case studies: IP6 Micro architecture. Compiler techniques for exposing ILP - Static branch prediction - Static multiple issues: VLIW - Advanced compiler support –Hardware VS software speculation.–Case study: Intel core i7 and ARM Cortex-A8

MODULE IV DATA-LEVEL PARALLELISM 9+2

Vector Architecture - SIMD Instruction Set Extensions for Multimedia - Graphic Processing Units- Detecting and Enhancing Loop Level Parallelism - Mobile verses Server GPUs - Case Studies

MODULE V **THREAD LEVEL PARALLELISM** **9+3**

Centralized Symmetric and shared memory Multiprocessor architectures - Performance issues - Distributed Shared Memory architecture- Directory based architecture- Synchronization - Cache Coherence and memory consistency -Trends in processor design- Need for multi-core processor – difference between multiprocessor and multicore processor- Thread level processing – Simultaneous multi-threading.

Total Hours : 60

REFERENCES :

1. John L. Hennessey and David A. Patterson," Computer Architecture: A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th Edition, 2012.
2. David A. Patterson and John L. Hennessy,Computer Organization and Design – The Hardware / Software Interface, 4th Edition, Morgan Kaufmann, Elsevier, 2009.
3. D.Sima, T. Fountain and P. Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.
4. Vincent P. Heuring and Harry F. Jordan, "Computer System Design and Architecture", Addison Wesley, 2nd Edition, 2004.
5. B.Govindarajalu, “Computer Architecture and Organization”, Tata McGraw Hill Education Pvt. Ltd., 2010.

OUTCOMES :

Students who complete this course will be able to

- Suggest the requirements for a new instruction set, to meet the functional requirement and to contribute to performance.
- To test the performance of a computer system
- To analyze changes in performance with various configurations and Memory Hierarchy
- Analyze code for instruction level Parallel Processing and modify the code for out of order execution for better performance
- Modify the code to exploit SIMD architecture and improve the performance of the system.
- Analyze how multi-threading in multiple processors and multi-core processors will share the resources for performance.

MAC6181 APPLIED ALGEBRA AND DISCRETE ALGORITHMS

L	T	P	C
3	1	0	4

OBJECTIVES :

The aim of this course is to

- Make the students familiarize on the concepts of mathematical induction and codes.
- Motivate the students to solve problems applying techniques of logic.
- To have a knowledge on the concepts of Formal languages and Automata theory.
- Familiarize students with basics of graph theory.
- Train the students in applying the basic concepts of Cryptography.

MODULE I INTEGERS, COMPUTER ALGEBRA AND CODES 9+3

Integers – computer algebra versus numerical analysis – sums and products – mathematical induction – Binary, Hexadecimal, ASCII, Morse, Braille, Two out of Five and Hollerith Codes.

MODULE II LOGIC 9+3

Propositional logic – logical connectives – truth tables – normal forms (conjunctive and disjunctive) – solving word problems - predicate logic - universal and existential quantifiers - proof techniques – direct and indirect – proof by contradiction – applications.

MODULE III MODELING, COMPUTATION AND LANGUAGES 9+3

Finite state machines - deterministic and non-deterministic finite state machines - classes of grammars - phrase structure grammar - context sensitive - context-free - regular grammars - formal languages - ambiguity - Turing machines.

MODULE IV GRAPH THEORY 9+3

Multigraphs - applications of graph theory - classes of graphs - subgraphs and morphisms - Hamilton circuits – planar graphs – shortest paths and spanning.

MODULE V CIPHERS 9+3

Cryptography - cryptanalysis - substitution and permutation ciphers – block cipher – the playfair cipher – unbreakable ciphers – applications.

Total Hours : 60

TEXT BOOKS:

1. Hopcraft, J. E, R. Motwani and Ullman, J. D, 'Introduction to Automata theory, Languages and Computation', Narosa publishing House, 4th edition 2006.

2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2015.

3. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, 1997.

REFERENCES:

1. JurajHromkovic, Theoretical Computer Science: Introduction to Automata, Computability, Complexity, Algorithmics, Randomization, Communication and Cryptography, Springer, 2003.

2. Darel W. Hardy, Fred Richman, Carol L. Walker, Applied Algebra: Codes, Ciphers and Discrete Algorithms, Second Edition (Discrete Mathematics and Its Applications), CRC Press, Newyork, 2009.

3. David Gries and Fred B. Schneider, A Logical Approach to Discrete Math, Springer, 3rd Edition, 1993.

OUTCOMES :

At the end of the course students will be able to

- Authenticate the correctness of the a given statement using mathematical induction.
- Test and analyze the logic of a program.
- Apply the concept of finite state machines and to generate languages.
- Analyze the types of graphs solve problems using the concepts of graph theory.
- Apply encryption and decryption techniques to send messages securely.

ITC6102	ADVANCED DATA STRUCTURES	L	T	P	C
		3	0	2	4

OBJECTIVES:

- Introduce the student to the concept of data structures through abstract data structures including lists, stacks, queues, sets/maps, trees, and graphs.
- To introduce the fundamental concept of data structures and to emphasize the importance of data structures.
- To choose the appropriate data structure for a specified application.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.

MODULE I LISTS, STACKS & QUEUES 9

Abstract Data Types - The List ADT – Implementation of List - The Stack ADT – Stack Model - Implementation of Stacks – Applications - The Queue ADT – Queue Model - Array Implementation of Queues – Applications of Queues.

MODULE II TREES 10

Preliminaries – Binary Trees – Expression Trees - Binary Search Trees – AVL Trees – Splay Trees – Tree Traversals - B trees.

MODULE III HASHING & HEAPS 8

General idea of Hashing – Hash function – Separate Chaining – Hash Tables without Linked lists – Rehashing - Binary Heap – Applications of Priority Queues – d-Heaps.

MODULE IV SORTING & THE DISJOINT SETS CLASS 7

Insertion Sort – Shell Sort – Heap Sort – Merge Sort – Quick Sort – The Disjoint Sets Class – Equivalence Relations – The Dynamic Equivalence Problem – Basic Data Structure – Path Compression.

MODULE V ADVANCED DATA STRUCTURES: GRAPHS & TREES 11

Graphs - Definitions – Topological Sort – Shortest Path Algorithm – Network Flow Problems – Minimum Spanning Tree – Trees - Sets – Maps - Top Down Splay Trees – Red Black Trees – Treaps.

Total Hours : 45

REFERENCES:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, 4th Ed., Addison Wesley, 2012.

2. Horowitz, Sahni, Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd edition, Universities Press, 2008.

3. Narasimha Karumanchi, “Data Structures And Algorithms Made Easy”, CareerMonk Publications, 2014.

OUTCOMES:

On completion of the course students will be able to :

- Discuss the abstract properties of various data structures such as lists, stacks and queues.
- Demonstrate the working of different types of trees.
- Outline the concepts of hashing and heaps.
- Explain the various sorting techniques and assess the working of disjoint sets class.
- Assess the different techniques employed by various types of graphs and trees.

CSC6103	COMPUTER NETWORKS AND MANAGEMENT	L	T	P	C
		2	0	2	3

OBJECTIVES :

- Outline the basic concepts of computer networks
- Illustrate the operations of network traffic, congestion, controlling and Queuing delay models
- Compare different mechanism for Quality of Service and Internet protocols
- Describe the concept and architecture of Network Management
- Showcase the different network management protocols like SNMP and RMON
- Identify various network tools to simulate the working of connection oriented and connectionless networks.

MODULE I INTRODUCTION TO COMPUTER NETWORKS 9

Introduction – Reliable Transmission via Redundancy – Reliable transmission by retransmission - Routing and addressing – Link Layer Protocols and Technologies – Quality of Service overview

MODULE II TRANSMISSION CONTROL PROTOCOL (TCP) AND SWITCHING AND QUEUING DELAY MODELS 9

Introduction to UDP and TCP – User Datagram Protocol (UDP) – TCP and Reliable Byte Stream Service – Congestion Control – Fairness – Recent TCP Versions – TCP Wireless Links - Packet Switching in Routers - Queuing Model – Networks of Queues

MODULE III MECHANISMS FOR QUALITY OF SERVICE AND INTERNET PROTOCOLS 9

Queue Scheduling – Policing – Active Queue Management – MPLS - Internet Protocol Version (IPV6) – Routing Protocols – Address Translation Protocols – Domain Name System (DNS) – Network Management Protocols – Network Tools

MODULE IV NETWORK MANAGEMENT AND SNMP 9

Network Management : goals , Organization and Functions – Network Management Architecture and organization – Network Management perspective – NMS platform – Current Status & future of Network Management – SNMP V1 Network Management- Basic Foundation standards, Models and languages – Organization and information Models - Communication and functional Models – SNMP V2 – SNPV3

MODULE V RMON, NETWORK MANAGEMENT TOOLS AND APPLICATIONS 9

Remote Monitoring – RMON SMI & MIB –RMON1-RMON2-ATM Remote Monitoring – A Case Study of Internet Traffic using RMON – Network Management Tools, Systems and Engineering –System utilities for Management – Network Statistics Measurement Systems – MIB Engineering – NMS Design – Network Management Applications

Total Hours : 45

REFERENCES :

1. Ivan Marsic , "Computer Networks Performance and Quality of Service" , Rutgers University, New Brunswick, New Jersey, 1st edition, FREE PDF, ISBN-10: N/A and ISBN-13-N/A, http://www.ece.rutgers.edu/~marsic/books/CN/ ,2013.
2. Mani Subramanian "Network Management : Principles and Practice ",2nd edition, Pearson Edition, ISBN-13: 978-8131734049, ISBN-10: 8131734048, 2010.
3. Olivier Bonaventure **,"Computer Networking : Principles, Protocols and Practice"** By Creative Commons Attribution (CC BY) ISBN: 978-1-365-18583-0, 2011.
4. Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" 5th Edition , Elsevier , 2014,ISBN-13: 978-0123850591, ISBN-10: 0123850592, 2014.
5. Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI,ISBN-13: 978-0136085300, ISBN-10: 013608530X, 2014.

OUTCOMES :

Students who complete this course will be able to

- Describe the network services, protocols and architectures
- Identify the different congestion control techniques
- Develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.
- Apply SNMP and RMON for Managing Network.
- Access MIBS from devices using SNMP on a workstation
- Analyze and interpret the data provided by an NMS and take suitable actions

ITC6103 SOFTWARE DEVELOPMENT METHODOLOGIES

L	T	P	C
2	0	0	2

OBJECTIVES:

- To learn various software process model
- To understand the analysis and design concept
- To learn how to improve the software development process

MODULE I SOFTWARE PROCESS MODELS **10**

Software Life Span Models – Software Technologies – Software Models – Specialized Process Models – The Unified Process – Agile Development – Software Processes – Team Iterative Processes – Initial Development – Final Stages

MODULE II SOFTWARE REQUIREMENTS ANALYSIS & DESIGN **10**

Unified Modeling Language – Object Oriented Analysis Process: Identifying Classes – Object Analysis: Classification – Identifying Object Relationships, Attributes and Methods – Designing Classes – Design Pattern

MODULE III SOFTWARE PROCESS IMPROVEMENT **10**

Testing Conventional Applications – Testing Web Applications – Software Process Improvement – Emerging Trends in Software Engineering

Total Hours : 30

REFERENCES:

1. Roger S. Pressman, “software engineering” 7th edition, Mc Graw Hill Education, 2014
2. Vaclav Rajlich, “Software Engineering: The Current Practice”, CRC Press, 2012
3. Ali Bahrami, "Object Oriented Systems Development", Tata McGraw-Hill, 1999.

OUTCOMES:

On completion of the course students will be able to:

- Choose most appropriate software process model
- Analyze the given requirements and prepare the design document
- Outline the different methods for software process improvement

ITC6104	INDUSTRY ORIENTED CASE STUDY	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To give students the experience of writing an industry oriented case study that meets the technical requirements of a research journal.
- To impress upon the student an understanding of research issues in industries and importance of research in education.
- To give students the experience of evaluating new and current knowledge.

COURSE DESCRIPTION:

In this course the student will prepare a written case study. The selection of an appropriate case, a thorough review of the elements of a case study report, how to review the appropriate literature for the reference section, and the systematic construction of the report will be covered in a combination of lecture and self study format. It is expected that the case study will meet the technical requirements for consideration to publish in a research journal. This industry oriented case study course is intended to give the student hands-on experience writing a case study report coupled with an appreciation of the importance, necessity and benefits of case study reporting to their professional experience.

INDUSTRY ORIENTED CASE STUDY:

- Introduction to the Industry Oriented Case Study Research Report - **Objectives**
- Literature survey on research issues in industries - **Strategic research and analysis**
- Writing research proposal – Case study for research issue in Industry - **Approach**
- Review of a Case Study Research Report – **Deliverables & Impacts**
- Presentation on Case Study Report

REFERENCES:

1. https://www.griffith.edu.au/__data/assets/pdf_file/0020/320177/writing-a-case-study.pdf
2. http://www.martin-flatin.org/papers/ecows2004.pdf
3. http://www.tcs.com/resources/case_studies/Pages/default.aspx
4. http://www.tcs.com/research/Pages/TCS-IoT-Offerings-Platform.aspx
5. http://www.tcs.com/resources/white_papers/Pages/default.aspx
6. http://www.tcs.com/resources/case_studies/pages/tcs_on-demand_watermarking_system_studio.aspx

OUTCOMES:

On completion of the course students will be able to:

- Perform a literature review.
- Develop the intervention and outcomes components of the case study report.
- Construct a case study report with various sections.
- Recognize the importance of ethics in the conduct of research in industries.
- Prepare properly a formatted reference.
- Choose an appropriate journal for submission of case study work.

SEMESTER II

ITC6201	**CLOUD COMPUTING TECHNOLOGIES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- To gain understanding of the basic concepts of cloud computing.
- To learn various types of cloud services, technologies and service providers.
- To know the design challenges of cloud infrastructure.
- To have knowledge about different programming models and cloud software.
- To understand the privacy and security issues in cloud environments.

MODULE I CLOUD COMPUTING BASICS 8

Introduction to Cloud Computing – Cloud computing reference model- Essential Characteristics - Benefits and challenges of cloud computing- Cloud Delivery Models - Deployment models -Cloud computing vendors

MODULE II CLOUD COMPUTING TECHNOLOGY 10

Virtualization-Types of virtualization-Virtualization and cloud computing- Client- thin, thick, mobile clients- Cloud Providers and Consumers-Various Cloud Services- Accessing the Cloud- Frameworks- AJAX, Python- Web Hosting Services- Web Applications- Web API's and Web Browsers.

MODULE III CLOUD INFRASTRUCTURE 9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development– Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

MODULE IV PROGRAMMING MODEL 10

Map Reduce programming model - Map reduce and extensions - Relational operations – Parallel Efficiency of Map Reduce- Cloud File Systems - GFS and HDFS –Cloud platforms in Industry – Google App Engine, Amazon AWS- Cloud Software Environments -Eucalyptus, Open Nebula.

MODULE V SECURITY IN CLOUD 8

Cloud security fundamentals- Privacy and Security in cloud - Software-as-a-Service Security Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security.

Total Hours: 45

REFERENCES:

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach ", McGraw-Hill, 2010.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly, 2009.
4. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing Principles and Paradigms" John Wiley & Sons, Inc Publications, 2011
5. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, "Mastering Cloud Computing", McGraw-Hill Education Private Ltd.,2013
6. Tim Malhar, S.Kumaraswammy, Shahed Latif , " Cloud Security & Privacy", O'Reilly media , 2009.

OUTCOMES:

On completion of the course students will be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Discuss the cloud technologies including virtualization and web based technologies.
- Explain the cloud file systems and their applications in industry.
- Explain the core issues of cloud computing such as security, privacy and interoperability

GEC6201 RESEARCH METHODOLOGY FOR ENGINEERS **L T P C**

3 0 0 3

COURSE EDUCATIONAL OBJECTIVES:

- To provide a perspective on research to the scholars
- To educate on the research conceptions for designing the research
- To impart knowledge on statistical techniques for hypothesis construction
- To gain knowledge on methods of data analysis and interpretation
- To learn about the effective communication of research finding

MODULE I RESEARCH PROBLEM FORMULATION **07**

Research – objectives – types, Research process, Solving engineering problems, Identification of research topic, Formulation of research problem, Literature survey and review.

MODULE II HYPOTHESIS FORMULATION **08**

Research design – meaning and need – basic concepts, Different research designs, Experimental design – principle – important experimental designs, Design of experimental setup, Mathematical modeling, Simulation – validation and experimentation, Dimensional analysis and similitude.

MODULE III STATISTICAL TECHNIQUES **12**

Statistics in research – concept of probability – popular distributions –Hypothesis testing- sample design- Design of experiments – factorial designs –– orthogonal arrays- ANOM - ANOVA - Multivariate analysis - Use of optimization techniques – traditional methods – evolutionary optimization techniques –Transportation model.

MODULE IV STATISTICAL ANALYSIS OF DATA **10**

Research Data analysis – interpretation of results – correlation with scientific facts-Accuracy and precision – error analysis, limitations - Curve fitting, Correlation and regression.

MODULE V RESEARCH REPORT 08

Purpose of written report – audience, synopsis writing, preparing papers for International journals, Thesis writing – organization of contents – style of writing – graphs and charts – referencing, Oral presentation and defence, Ethics in research, Patenting, Intellectual Property Rights.

Total Hours: 45

REFERENCES:

1. Ganesan R., Research Methodology for Engineers, MJP Publishers, Chennai, 2011.
2. Ernest O., Doebelin, Engineering Experimentation: planning, execution, reporting, McGraw Hill International edition, 1995.
3. George E. Dieter., Engineering Design, McGraw Hill – International edition, 2000.
4. Madhav S. Phadke, Quality Engineering using Robust Design, Printice Hall, Englewood Cliffs, New Jersey, 1989.
5. Kothari C.R., Research Methodology – Methods and Techniques, New Age International (P) Ltd, New Delhi, 2003.
6. Kalyanmoy Deb., "Genetic Algorithms for optimization", KanGAL report, No.2001002.
7. Holeman, J.P., Experimental methods for Engineers, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2007.
8. Govt. of India, Intellectual Property Laws; Acts, Rules & Regulations, Universal Law Publishing Co. Pvt. Ltd., New Delhi 2010.
9. University of New South Wales, "How to write a Ph.D. Thesis" Sydney, Australia, Science @ Unsw.
10. Shannon. R.E., System Simulation: the art and science, Printice Hall Inc, Englewood Cliffs, N.J.1995.
11. Scheffer. R.L. and James T. Mc Clave, Probability and Statistics for Engineers, PWS – Kent Publishers Co., Boston, USA, 1990.

COURSE OUTCOMES:

Students should be able to

- Formulate the research problem
- Design and Analyse the research methodology
- Construct and optimize the research hypothesis
- Analyse and interpret the data
- Report the research findings

ITC6202 **MOBILE APPLICATION DEVELOPMENT** **L T P C**
1 0 2 2

OBJECTIVES:

- To know the importance of mobile applications.
- To learn the fundamentals of Android application development.
- To learn the fundamentals of iOS application development.
- To develop simple mobile applications using Android and iOS.

THEORETICAL STUDY

ANDROID APPLICATION DEVELOPMENT **7**

Android Basics - Android Architecture - Application Framework - The Manifest file - Libraries – Developing - Managing Virtual Devices - Building and Running – Debugging – Testing - Building Blocks - Application Components - Content Providers - Broadcast Receiver - Processes and Threads - Data storage - SQLite Databases - Localization - User Interface.

iOS APPLICATION DEVELOPMENT **8**

iOS Basics - iOS Architecture - Integrated development Tools - Objective C - Frame work and Libraries - Project templates - Resource & Application Settings - Views & Controls - Debugging & Running - Building Block Approach - Application Life cycle - MVC – Pattern - View - Data Management - Core Data - Application Storage - External Storage - Memory Management - UI Design - Design Tools - Interface Builders - Story board - View Controllers - Drawing model – Windows - Event Handling - View data Source and delegates.

30

LABORATORY PRACTICE

- Developing Simple Android Applications (2 exercises)
- Developing Simple iOS Applications (2 exercises)
- Mobile application development in Android and iOS. (Students can select their own problem to develop an Application)

  Sample applications
  - Scientific calculator
  - Home Automation
  - Live Chat
  - Currency converter
  - To do list
  - Games

Total Hours : 45

REFERENCES:

1. Frank Ableson.W, Robi Sen, Chris King, Enrique Ortiz, “Android in Action”, Dreamtech Press, 2012.
2. DiMarzio. J.F. “Android: A Programmer’s Guide”, McGraw Hill, 2008.
3. Rob Napier, Mugunth kumar, “iOS 7 Programming”, Wiley, 2014.
4. Erica Sadun, “The iOS 5 Developer’s Cookbook”, Pearson, Third Edition, 2012.

OUTCOMES:

On completion of the course students will be able to :

- Describe the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies.
- Apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT)) and learn how and when to apply the different components to develop a working system.
- Work within the capabilities and limitations of a range of mobile computing devices.
- Design, implement and deploy mobile applications using an appropriate software development environment.

ITC6203	SOFTWARE DEVELOPMENT AND TESTING LAB	L	T	P	C
		0	0	2	1

OBJECTIVES:

• To practice software engineering concepts using automated tools.
• To practice object oriented system development methodologies.

List of Sample Exercises

1. Health Insurance Management System
2. Mobile Recharging System
3. Tour Management System
4. Conference Management System
5. E-Banking System

Develop the following for the above applications using Object Oriented System Development Methodologies:

1. Project Planning
2. Software Requirement Analysis
3. Software Estimation
4. Software Design
5. Data Modeling & Implementation
6. Software Testing
7. Software Debugging

Total Hours : 30

OUTCOMES:

On completion of the course students will be able to :

- Develop any software in a systematic manner.
- To test software using automated tools.

SEMESTER III

ITC7102	INTERNET OF THINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the basics of Internet of things.
- Utilize IoT features and create applications based on IoT protocols.
- To discuss the features of cloud of things and web of things.
- Outline the embedded prototyping and design and apply the use of Devices in IoT Technology.
- To explain Real World IoT Design and compile the same.

MODULE I INTRODUCTION **10**

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.

MODULE II IOT PROTOCOLS **9**

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 – Modbus – KNX – ZigBee Architecture – Network layer – APS layer.

MODULE III CLOUD OF THINGS **8**

Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture **–** 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.

MODULE IV DESIGN PRINCIPLES OF CONNECTED DEVICES **9**

Technology for design –Privacy in storing data – Internet principles for connected devices- Prototypes and production –Changing embedded platform - open source versus closed source- prototyping embedded devices – Electronics- Sensors – Actuators – Arduino – Raspberry PI – Beagle Bone Black – Electric Imp.

9

MODULE V PROTOTYPING ONLINE COMPONENTS AND EMBEDDED CODING

Sketch – Iterate and Explore – Preparation of physical prototype – Getting started with API – Writing New API - Writing New API – Real Time Reactions – Other Protocols - Techniques for Writing Embedded code –Memory Management – Performance and Battery Life – Libraries and Debugging.

Total Hours : 45

REFERENCES:

1.The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press –2012
2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011.
3. Designing internet of things –Adrian McEwen & Hakim Cassimally – Jhon Wiley and sons – 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

OUTCOMES:

On completion of the course students will be able to :

- Identify and design the new models for market strategic interaction
- Analyze various protocols for IoT
- Analyze and compare Cloud of things and Web of things
- Design a middleware for IoT
- Analyze and design different models for embedded devices.

SEMESTER II PROFESSIONAL ELECTIVES

ITCY201	MULTICORE PROGRAMMING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters.
- To appreciate the need for parallel processing.
- To expose the students to the problems related to multiprocessing
- To expose the students to warehouse-scale and embedded architectures
- To understand the different types of multicore architectures.

MODULE I FUNDAMENTALS OF QUANTITATIVE DESIGN & ANALYSIS 9

Classes of Computers – Trends in Technology, Power, Energy and Cost – Dependability – Measuring, Reporting and Summarizing Performance – Quantitative Principles of Computer Design – Classes of Parallelism - ILP, DLP, TLP and RLP - Multithreading - SMT and CMP Architectures – Limitations of Single Core Processors - The Multicore era – Case Studies of Multicore Architectures.

MODULE II DLP IN VECTOR, SIMD AND GPU ARCHITECTURES 9

Vector Architecture - SIMD Instruction Set Extensions for Multimedia – Graphics Processing Units - Detecting and Enhancing Loop Level Parallelism - Case Studies.

MODULE III TLP AND MULTIPROCESSORS 9

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues -performance Issues – Synchronization Issues – Models of Memory Consistency – Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

MODULE IV RLP AND DLP IN WAREHOUSE-SCALE ARCHITECTURES 9

Programming Models and Workloads for Warehouse-Scale Computers – Architectures for Warehouse-Scale Computing – Physical Infrastructure and Costs – Cloud Computing – Case Studies.

MODULE V ARCHITECTURES FOR EMBEDDED SYSTEMS 9

Features and Requirements of Embedded Systems – Signal Processing and Embedded Applications – The Digital Signal Processor – Embedded Multiprocessors - Case Studies.

Total Hours : 45

REFERENCES:

1. John L. Hennessey and David A. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
3. Michael J Quinn, “Parallel programming in C with MPI and OpenMP”, Tata McGraw Hill, 2003.
4. Wesley Petersen and Peter Arbenz, “Introduction to Parallel Computing”, Oxford University Press, 2004.

OUTCOMES:

On completion of the course students will be able to :

- Identify the limitations of Instruction-level parallelism and the need for multi-core
- architectures.
- Analyze the salient features of different multicore architectures and how they exploit
- Parallelism.
- Critically analyze the different types of inter connection networks.
- Discuss the architecture of GPUs, warehouse-scale computers and embedded processors

  Solve the issues related to multiprocessing and suggest solutions.

ITCY202	SOFTWARE REQUIREMENTS MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To overview about the requirements engineering.
- To learn requirements elicitation technique.
- To study about analyzing the requirements.
- To develop requirements specification document.
- To learn requirement validation technique.

MODULE I REQUIREMENTS ENGINEERING OVERVIEW 9

Introduction to Requirements Managements – Requirements and Software Life Cycle – Requirements from Customer's Perspective - .Good Practice for Requirements Engineering – The Business Analyst

MODULE II REQUIREMENTS ELICITATION 9

Establishing the Business Requirements – Finding the Voice of the User – Requirements Elicitation – Interviewing – Requirements Workshop – Brainstorming and Idea Reduction – Storyboarding

MODULE III REQUIREMENTS ANALYSIS 9

Identification of Functional and Non Functional Requirements – Understanding User Requirements - The Five Steps in Problem Analysis – Business Modeling – A Use Case Primer – Organizing Requirements Information

MODULE IV REQUIREMENTS DEVELOPMENT 9

The Vision Document – Establishing Project Scope – Playing by the Rules – Documenting the Requirements – Writing Excellent Documents – A Picture is worth 1024 Words – Specifying Data Requirements -

MODULE V REQUIREMENTS VALIDATION & MANAGEMENT 9

Risk Reduction Through Prototyping – Setting Requirements Priorities – Validating Requirements – Requirements Management Practice – Change Happens – Tools for Requirements Engineering

Total Hours : 45

REFERENCES:

1. Karl Eugene Wiegers, “Software Requirements”, Microsoft Press, 2013.
2. Dean Leffingwell, Don Widrig, “Managing Software Requirements,: A Use Case Approach”, Second Edition Addison Wesley, 2003.
3. Ian Sommerville, Pete Sawyer, “Requirements Engineering: A Good Practice Guide”, John Wiley and sons, 2009.

Ian Graham, “Requirements Engineering and Rapid Development”, Addison Wesley, 1998.

OUTCOMES:

On completion of the course students will be able to :

- Outline the fundamental concepts of requirements engineering
- Elucidate the complete software requirements
- Analyze the software requirements
- Prepare a Software Requirements Specification document
- Validate the software requirements

ITCY203	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the components of the social network
- To model and visualize the social network.
- To mine the users in the social network..
- To understand the evolution of the social network.
- To mine the interest of the user.

MODULE I INTRODUCTION **9**

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.

MODULE II MODELING AND VISUALIZATION **9**

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 – Modeling and aggregating social network data – Random walks and their applications – Use of Hadoop and Map Reduce – Ontological representation of social individuals and relationships.

MODULE III INVESTIGATION **9**

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

MODULE IV EVOLUTION **9**

Evolution in Social Networks – Framework – Tracing Smoothly Evolving Communities – Models and Algorithms for Social Influence Analysis – Inflence 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 Probablistic Models – Probablistic Relational Models.

MODULE V LAWS AND ACTS 9

Text Mining in Social Networks – Opinion extraction – Sentiment classification and clustering – Temporal sentiment analysis – Irony detection in opinion mining – Wish analysis – Product review mining – Review Classification – Tracking sentiments towards topics over time.

Total Hours : 45

REFERENCES:

1. Charu C. Aggarwal, "Social Network Dta Analytics", Springer, 2011.
2. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007.
3. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, First Edition, 2010.
4. Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, First Edition, 2011.
5. Giles, Mark Smith, John Yen, " Advances in Social Network Mining and Analysis", Springer 2010.
6. Ajith Abraham, Aboul Ella Hassanien, Vaclav Snasel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.

OUTCOMES:

Upon completion of the course, the student will be able to

- Work on the internal components of the social network.
- Model and visualize the social network.
- Mine the behavior of the users in the social network.
- Predict the possible next outcome of the social network.
- Mine the opinion of the user.

ITCY204 MULTIMEDIA TECHNOLOGY AND APPLICATIONS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce students to various multimedia elements along with the theoretical underpinnings and to expose them to integration of these elements.
- Gives the technological knowledge necessary for creating multimedia content for the web, video, DVD and cellular phones, 2D and 3D graphics, sound and programming.
- Provides an insight into digital technologies, media authoring, storage and distribution tools.
- Keep up with the current development of contemporary systems of multimedia technology.

MODULE I MULTIMEDIA COMPONENTS **9**

Introduction to Multimedia: Multimedia Elements - Multimedia System Architecture - Evolving technologies for Multimedia - Defining objects for Multimedia systems - Multimedia Data interface standards - Multimedia Databases.

MODULE II MULTIMEDIA COMPONENTS **9**

Overview of Text and Character representations - Audio: Basic Concepts - Data acquisition and digitization - Audio Formats - Image : Image Representation Formats and compression techniques - Color Schemes - Video : Analogue and Digital Video - Recording Formats and Standards - Transmission of Video Signals - Video Capture - Video compression techniques.

MODULE III DOCUMENT ARCHITECTURE & CONTENT MANAGEMENT **9**

Content Management: Content Design and Development - General Design Principles - Hypertext Concepts - Open Document Architecture (ODA) - Multimedia and Hypermedia Coding Expert Group (MHEG) - Standard Generalized Markup Language (SGML) - Document Type Definition (DTD) - Hypertext Markup Language (HTML) in Web Publishing.

MODULE IV MULTIMEDIA NETWORKS **9**

- Multimedia Networks: Basics of Multimedia Networks - Multimedia Network Communications and Applications - Quality of Multimedia Data Transmission - Multimedia over IP - Multimedia over ATM Networks - Transport of MPEG-4 - Media-on-Demand (MOD).

-

MODULE V APPLICATIONS **9**

Multimedia in the Real World: Video conferencing - Virtual reality - Interactive video - video on demand - Training and Education - Kiosks - Image Processing

- The Multimedia Office - Multimedia in the Home - Case Study: Application for Industrial - Educational and Medical Domains.

Total Hours : 45

REFERENCES:

1. Ralf Steinmetz and Klara Nahrstedt, "Multimedia:Computing, Communications and Applications", Prentice - Hall, India. 2008.
2. Vaughan T, Multimedia, Tata McGraw Hill, Seventh Edition ,2008
3. Ze-Nian Li and Mark S. Drew, Fundamentals of Multimedia, Pearson Education, 2008.
4. Andleigh P.K., Thakrar K., Multimedia Systems Design (PHI).2003.

OUTCOMES:

On completion of the course students will be able to :

- Outline and critically analyze the different elements of multimedia systems
- Apply and demonstrate the features of text, audio, images, video and active contents of multimedia elements.
- Outline the concepts of document architecture and develop user friendly web pages using HTML and DTD.
- Discuss the multimedia network communications and applications.
- Apply the various applications of multimedia.

ITCY205 **DISTRIBUTED SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the importance of communication in distributed environment and the actual implementation of various communication mechanisms.
- To study how a distributed operating system works and how it differs from the single processor OS.
- To learn how to manage the resources in a distributed environment.
- To learn how to make a distributed systems fault tolerant.
- To study how the above-mentioned techniques have been used in actual, real-life distributed systems.

MODULE I COMMUNICATION IN DISTRIBUTED ENVIRONMENT 9

Introduction - Client - Server Paradigm - Threads in distributed Systems - Remote Procedure Call - Remote Object Invocation - Message-Oriented Communication - Unicasting - Group Communication - Reliable and Unreliable Multicasting.

MODULE II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System - Lamport's Logical clock - Vector Clock - Causal Ordering - Global States - Election Algorithms - Distributed Mutual Exclusion - Distributed Transaction - Distribute Deadlock

MODULE III DISTRIBUTED SHARED MEMORY 9

Introduction - Data - Centric Consistency Models - Client - Centric Consistency Models - Distribution Protocols - Consistency Protocols - IVY - Munin - Atomic Transaction.

MODULE IV FAULT TOLERENCE & DISTRIBUTED FILE SYSTEM 9

Introduction to fault Tolerance - Distributed Commit Protocol - Distributed File System Architecture - Issues in Distributed File Systems - Sun NFS

MODULE V CASE STUDIES 9

Distributed Object - Based System - CORBA - COM - Distributed Coordination Based System – JINI - Distributed Web Based System - Google.

Total Hours : 45

REFERENCES:

1. A.S. Tanenbaum, M. Van Steen, “Distributed Systems: Principles and Paradigms”, Pearson Education, 2004.
2. George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Third Edition, Pearson Education Asia, 2002.
3. Mukesh Singhal, “Advanced Concepts in Operating Systems”, McGraw Hill Series in Computer Science, 1994.
4. M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

OUTCOMES:

On completion of the course students will be able to :

- On completion of the programme students will be able to :
- Identify the communication issues in the distributed systems and how it can be used in remote procedure calls, remote objects and message-oriented communication.
- Analyze the principles of distributed operating systems through various algorithms.
- Select suitable consistency model for distributed shared memory.
- Predict the faults and find the solutions in distributed systems.
- Create the distributed file system architecture for real world needs.
- Compare and demonstrate various case studies in distributed systems.

ITCY206	IT INFRASTRUCTURE AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To familiarize with overview of IT infrastructure management.
- To analyze IT service management with different architectures
- To discuss and practice about storage, backup and recovery in an organization.
- To utilize security techniques and patterns available in market.
- To explore recent trends and apply it in real time.

MODULE I Introduction **9**

Introduction – Network basics – Computer basics - IT Infrastructure Management – Challenges in IT infrastructure – Design issues of IT organization and IT Infrastructure – Determining customer's requirement- IT Systems management Process – Systems Management Building Blocks-IT Service Management Process – Patterns for IT Systems Management –Information System design process – IT Infrastructure Library (ITIL).

MODULE II IT Service Management **9**

Service level management – Financial Management – IT service continuity Management – capacity Management – Availability Management – Configuration Management – Incident Management – Change Management – Release Management – IT service management architecture – Overview of ITSM Architecture – Technology Infrastructure – Physical facilities – Network – Hardware - Virtualization Platforms–ITIL Service Architecture - Service Lifecycles – IT-Service Lifecycle Overview – Setting Objectives – Utility and Warranty

MODULE III Data Storage and Networking Management **9**

Introduction to storage – Backup and Storage – Archive and Retrieve – Disaster Recovery – Space Management – Bare Machine Recovery (BMR) – Data Retention – Storage Devices – RAID – Fiber Channel SAN-Replication Technologies – Storage Virtualization – Backup and Recovery management- Back Architecture and Policies – Storage management – Capacity and Performance Management-Management protocols and Interfaces.

MODULE IV Security Management **9**

Introduction - Computer Security – Internet Security –Risk Management- CIA Classification-Countermeasures based on CIA-Cryptography-Hash functions-Theft of information- Identity Management- Installing malicious softwares- Intrusion Detection -Social Engineering-Phishing and Bating –Security Patterns -Layered Security- Ethical Hacking - IPR – Privacy and law – Computer Forensics – Cyber Crimes.

MODULE V Trends in IT Infrastructure 9

Cloud Computing – The cloud Model – Deployment Models – Service Models – IaaS – PaaS – SaaS – DaaS – Green IT – Data Centers – Enhance efficiency of Data center – BYOD – Big Data – DFS – GFS – HDFS – Hadoop – Configuration and Scheduling– Global system for mobile communication using cloud- Case study of networking using emerging trends - Deployment using Cloud / Hadoop / Mobile communications.

Total Hours : 45

REFERENCES:

1. Prof Phalguni Gupta, Mr. Surya Prakash, IT Infrastructure and its Management , Tata McGraw Publications, New Delhi, 2010 .
2. Sjaak Laan,Infrastructure Architecture - Infrastructure Building Blocks and Concepts Second Edition, Lulu Press Inc, 2013.
3. Nigel Poulton, Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond , Sybex, Jhon Wiley and Sons, 2014.
4. Chris Britton, Peter Bye, IT Architectures and Middleware: Strategies for Building Large, Integrated Systems, 2nd Edition, Addison wesley, 2004.
5. Randy A. Steinberg, Architecting ITSM: A Reference of Configuration Items and Building Blocks for a Comprehensive IT Service Management Infrastructure, Trafford publishing, Novemenr 2014.
6. Lars Dibbern, IT Service Management using ITIL® and UML, 60CO Press, 2nd edition, 2016.
7. Clyde Bank Technology, ITIL For Beginners - The Complete Beginner's Guide To ITIL (ITIL, ITIL Foundation, ITIL Service Operation) ,ClydeBank media , 2011.

OUTCOMES:

On completion of the course students will be able to:

- To discuss the introduction of IT infrastructure management.
- To outline different service architectures and asses each one of them.
- To predict the storage techniques for different infrastructures.
- To utilize the security techniques and apply it in appropriate places.
- To analyze the recent trends in IT infrastructure and apply it in real time case study

ITCY207 **APPLIED CRYPTOGRAPHY** **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the classical cryptographic algorithms.
- To study the block cipher and advanced encryption standard.
- To learn RSA cryptosystem and issues in key distribution.
- To analyze the identification and authentication mechanisms.
- To understand the various secret sharing schemes.

MODULE I CLASSICAL CRYPTOGRAPHY 9

The Shift Cipher, The Substitution Cipher, The Affine Cipher Cryptanalysis-Cryptanalysis of the Affine Cipher, Cryptanalysis of the Substitution Cipher, Cryptanalysis of the Vigenere Cipher, Shannon's Theory.

MODULE II BLOCK CIPHER AND THE ADVANCED ENCRYPTION STANDARD 9

Substitution - Permutation Networks, Linear Cryptanalysis, Differential Cryptanalysis, The Data Encryption Standard, The Advanced Encryption Standard, Modes of Operation, Cryptography Hash Function - Hash Function and Data Integrity, Security of Hash Function, Iterated Hash Functions, Message Authentication Codes.

MODULE III RSA CRYPTOSYSTEM AND FACTORING INTEGERS 9

Introduction to Public –key Cryptography, Number theory, The RSA Cryptosystem ,Other Attacks on RSA, The ElGamal Cryptosystem, Shanks' Algorithm, Finite Fields, Elliptic Curves over the Reels, Elliptical Curves Modulo a Prime, Signature Scheme –Digital Signature Algorithm.

MODULE IV IDENTIFICATION SCHEME AND ENTITY AUTHENTICATION 9

Challenge and Response in the Secret-key Setting, Challenge and Response in the Public key Setting, The Schnorr Identification Scheme, Key distribution-Diffie-Hellman Key, Predistribution, Unconditionaly Secure key Predistribution, Key Agreement Scheme Diffie-Hellman Key agreement, Public key infrastructure-PKI, Certificates, Trust Models.

MODULE V SECRET SHARING SCHEMES 9

The Shamir Threshold Scheme, Access Structure and General Secret key sharing, Information Rate and Construction of Efficient Schemes, Multicast Security and Copyright production - Multicast Security, Broadcast Encryption, Multicast Re-keying, Copyright Protection, Tracing illegally redistribution keys.

Total Hours : 45

REFERENCES:

1. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall / CRC, 2006.
2. Menezes A. J, Oorschot P, Vanstone S.A, “Handbook of Applied Cryptography” CRC Press, 1997.
3. William Stallings, “Cryptography and Network Security: Principles and Practices”, Third Edition, Pearson Education, 2006.
4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.
5. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson Education, 2007.

OUTCOMES:

On completion of the course students will be able to :

- Apply the suitable substitution cipher algorithm for a real world problem.
- Compute the security of data using DES and AES.
- Use the RSA algorithm and factoring integers for secured data transfer.
- Analyze the challenges and responses in secret key distribution.
- Evaluate the secret sharing schemes as per the real world needs.

ITCY208	VIDEO PROCESSESING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Implement video processing techniques in new applications.
- Demonstrate an understanding of both theoretical and applications-related problems of the video processing systems.
- Know basic features of MPEG-2, MPEG-4, and H.264 video compression standards.

MODULE I VIDEO ACQUISITION AND REPRESENTATION 9

Spatial Temporal Sampling –Sampling Structure Conversion – Interpolation – Colour spaces – video formats.

MODULE II MOTION ANALYSIS 9

2D and 3D Motion Estimation and Compensation –Optical Flow methods – Block based – Point correspondences Gradient based – Intensity matching – Feature matching – Frequency domain Motion estimation.

MODULE III MOTION ANALYSIS APPLICATIONS VIDEO OBJECTRACKING AND SEGMENTATION 9

Video Summarization, Video Surveillance, Video Watermarking, Video Mosaicing.– 2D and 3D motion tracking –blob tracking – kernel based – Control tracking – Feature matching– Video Segmentation – Mean Shift based –Video shot boundary detection.

MODULE IV VIDEO FILTERING 9

Motion Compensation – Noise Filtering – Enhancement and Restoration – Video Stabilization and Super Resolution.

MODULE V VIDEO CODING REPRESENTATION AND VIDEO STANDARDS 9

MPEG 1, MPEG 2, MPEG 4, MPEG7, H.261, H.263, H.264. Video compression – Interframe Compression – 3D Waveform based – Motion Compensation.

Total Hours : 45

REFERENCES:

1. Handbook of Image and Video processing – Al Bovik (Alan C Bovik),Academic Press, Second Edition, 2005.
2. Digital Image Sequence Processing, Compression, and Analysis –Todd R. Reed, CRC Press, 2004.
3. H.264 and MPEG4 Video Compression: Video Coding for Next Generation Multimedia – Iain E. G. Richardson, Wiley, 2003
4. Digital Video Processing – A Murat Takalp, Prentice Hall, 1995.

OUTCOMES:

On completion of the course students will be able to :

- Solve practical problems with some basic image and video signal processing techniques.
- Analyze the 2D and 3D motion estimation and feature matching
- Evaluate the performance of video object segmentation and tracking methods
- Apply filtering and analyze the enhancement and restoration of video processing
- Design simple systems for realizing some multimedia applications with some basic video processing techniques.

ITCY209	HIGH SPEED NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To get an introduction about ATM and Frame relay.
- To provide an up-to-date survey of developments in High Speed Networks.
- To enable the students to know techniques involved to support real-time traffic and congestion control.
- To provide the different levels of Quality of Service (QoS) to different applications.
- Students will be able to design high speed networks with Quality of Services.

MODULE I HIGH SPEED NETWORKS **9**

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fibre Channel - Wireless LAN's: applications, requirements - Architecture of 802.11.

MODULE II CONGESTION AND TRAFFIC MANAGEMENT 9

Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

MODULE III TCP AND ATM CONGESTION CONTROL 9

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

MODULE IV INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services.

MODULE V PROTOCOLS FOR QOS SUPPORT 9

RSVP - Goals & Characteristics, Data Flow, RSVP operations, ProtocolMechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, RTCP.

Total Hours : 45

REFERENCES:

1. IrvanPepelnjk, Jim Guichard and Jeff Apcar, 'MPLS and VPN architecture', Cisco Press, Volume 1 and 2, 2003.

2. William Stallings, 'High Speed Networks And Internet', Pearson Education, Second Edition, 2002.

3. Warland&PravinVaraiya, 'High Performance Communication Networks', Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.

OUTCOMES:

On completion of the course students will be able to :

- Define the various high-speed networking technologies and their design issues.
- Manage projects involving any of the high-speed networking technologies.
- Design high speed networks with quality of service (QoS).
- Apply techniques involved to support real-time traffic and congestion control.
- Apply the concept learnt in this course to optimize and troubleshoot high-speed network.

CSCY01	MOBILE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To discuss about advanced learning in the field of wireless communication.
- To elaborate upon the basic concepts and principles in mobile computing.
- To expose the students to the concepts of wireless devices.
- To explain the structure and components for Mobile IP and Mobility Management
- To create awareness about various operating systems available for mobile computing
- To discuss various issues related to security of mobile computing environment

MODULE I INTRODUCTION 15

Mobile Computing- Networks- Application and Services supporting - Developing Mobile Computing Applications-Security in Mobile Computing Mobile Computing Architecture-GSM-Wireless Internet- Wireless Vehicular Networks-Architecture-Vehicular Applications-Standards-Challenges

MODULE II APPLICATION DEVELOPMENT 15

Three tier architecture -Model View Controller Architecture -Memory Management – Information Access Devices –PDAs and Smart Phones –Smart Cards and Embedded Controls –J2ME –Programming for CLDC –GUI in MIDP –Application Development ON Android and iPhone

.

Total Hours : 30

REFERENCES :

1. Asoke K Talukder, Nuno M. Garcia, Jayateertha G. M, “Convergence Through All-IP Networks”, Pan Stanford, ISBN: 978-9814364638, 2013.
2. Asoke K Talukder, HasanHasan Ahmed and Roopa R Yavagal, “Mobile Computing Technology, Applications and Service Creation”, 2nd Edition, Tata McGraw-Hill Education Private Limited, ISBN: 978-0070707313, 2011.

OUTCOMES :

Students who complete this course will be able to

- Acquire capability to work with heterogeneous networks.
- Apply the knowledge of various mobile operating systems like Android to develop mobile computing applications.
- Develop mobile computing applications by analyzing their requirements.
- Identify the security algorithms to be used for mobile computing environment.
- Analyze business practices in mobile computing applications and their technical feasibility.
- Comparatively evaluate deployment platforms for mobile computing applications.

CSCY10	ADVANCED DATABASES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To comprehend the different issues involved in the design and implementation of a database system
- To analyze the physical and logical database designs, database modeling, relational and object oriented models.
- To describe the techniques involved in the design of distributed databases.
- To recognize the various database techniques used in cloud and big data applications.
- To develop an understanding of emerging DBMS for various applications

MODULE I ADVANCED SQL QUERIES AND DATABASE TUNING 8

Relational model conformity and Integrity- Advanced SQL programming- Query optimization- Concurrency control and Transaction management- Database performance tuning-Distributed relational systems -Security issues in Databases.

MODULE II THE EXTENDED ENTITY RELATIONSHIP MODEL AND OBJECT MODEL 9

The ER model-Motivation for complex data types-User defined abstract data types and structured types- Subclasses- Super classes- Inheritance-Specialization and Generalization-Constraints and characteristics of specialization and Generalization-Relationship types of degree higher than two.

MODULE III DISTRIBUTED DATABASES 10

Distributed Systems- Parallel Databases: I/O Parallelism -Inter and Intra Query Parallelism -Inter and Intra operation Parallelism- Design of Parallel Systems. Distributed Database Concepts- Distributed Data Storage -Distributed Transactions - Commit Protocols - Concurrency Control -Distributed Query Processing - Case Studies.

MODULE IV INTRODUCTION TO CLOUD DATABASES AND BIG DATA 9

Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis. Batch computing models for Big Data computing- Key-value storage systems -- Scalable prediction models - Distributed file systems - Scalable data analytics-- Data models – Real time data stream analytics.

MODULE V EMERGING DATABASE MANAGEMENT SYSTEM TECHNOLOGIES 9

Object Oriented database concepts-Object Relational database concepts-Active database concepts; Temporal database concepts-Spatial database concepts and architecture- Deductive databases and Query processing- Mobile Databases-Geographic Information Systems. Multimedia Databases; Multidatabases- Native XML databases (NXD)-Genome Data management.

Total Hours : 45

REFERENCES :

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2011.
2. Jeff Hoffer, Ramesh Venkataraman, HeikkiTopi, “Modern Database Management Systems”, Pearson Education Limited, 12th edition, 2016.
3. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, 6th edition, Pearson Education, 2014.
4. Carlos Coronel and Steven Morris, “Database Systems: Design, Implementation, & Management”, Cengage Learning, 12th edition, 2016.

OUTCOMES :

Students who complete this course will be able to

- Define the terminology, features, classifications, and characteristics in database systems.
- Illustrate the design strategies, query processing techniques and algorithms for advanced databases.
- Analyze an information storage problem and derive at an appropriate data model for the problem.
- Assess the Database techniques for designing intelligent information retrieval system for any application.
- Describe the database techniques used in Cloud and Big data environment.
- Appraise the emerging technologies in Databases and propose suitable model for any given application

CSCY54	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To establish the fundamentals and issues relating to Service Oriented Architecture.
- To bring out the importance of service orientation and web services.
- To teach appropriate tools as technique on how to build the Service Oriented Architecture with web services.
- To gain knowledge of basic principles of Service-Oriented Architecture and apply these concepts to develop a sample application
- To assess emerging and proposed standards for the main components of Web services architectures.
- To become skilled at standards related to Web services: Web Services Description Language (WSDL), Simple Object Access Protocol (SOAP), and Universal Description, Discovery and Integration (UDDI).

MODULE I INTRODUCTION 9

Basic definition - Fundamentals of SOA - Characteristics about SOA-Benefits and pitfalls of SOA. Evolution of SOA - Web service and primitive SOA - The extension of SOA - Web service extension.

MODULE II WEB SERVICE AND CONTEMPORARY SOA 9

Message Exchange Pattern- Service Activity- Coordination- Atomic Transaction- Business Activity- Orchestration – Choreography- Addressing Reliable Messaging- Correlation and Policies- Meta data Exchange- Security Notification and Eventing.

MODULE III PRINCIPLES OF SERVICE ORIENTATION 9

Principles of service orientation -Building SOA-Planning and Analysis- SOA delivery strategies -Service Oriented Analysis Introduction -Service Modeling of Service Oriented Analysis.

MODULE IV SERVICE ORIENTED DESIGN 9

Introduction to service oriented design - WSDL related XML Schema language - WSDL Language Basics - SOAP Language Basics - Service interface design tools - Steps to composing SOA - Consideration for choosing service layers - SOA extension - Service design and business process design.

MODULE V WEB SERVICE EXTENSION AND SOA PLATFORM 9

WS Addressing language Basics - WS Reliable Messaging language Basics- policy Language Basics- WS Metadata Exchange Language Basics- WS security Language Basics -SOA Platform basics- SOA Support in J2EE, SOA Support in .NET- Case Studies.

Total Hours : 45

REFERENCES :

1. Thomas Erl, “Service Oriented Architecture, Concepts, Technology and Design”, Pearson Education, 2009. ISBN-13: 007-6092038498
2. Thomas Erl, “Service Oriented Architecture, Design Patterns”, Prentice Hall, 2009: ISBN-13: 978-0-13-613516-6
3. Shankar Kambhampaty, “Service Oriented Architecture for Enterprise Architecture for Enterprise Application”, 1st Edition, Wiley Publication, 2008.

OUTCOMES :

Students who complete this course will be able to

- Relate web services with service oriented architecture.
- Analyze the issues related to SOA.
- Apply the tools and technique for Service Oriented Architecture.
- Develop service design using WSDL and XML schema languages.
- Choose appropriate SOA extensions for a particular design
- Assess SOA platform supported by J2EE and .NET.

ITCY210	VIRTUALIZATION TECHNIQUES	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To understand the concept of virtualization and how to apply virtualization for server consolidation.
- To impart knowledge on software defined networks (SDN), network and storage virtualization
- To understand applications and virtual devices in virtual machines.

MODULE I VIRTUALIZATION & SERVER CONSOLIDATION 10

Understanding Virtualization - Virtualization Advantages - Virtual Machine Basics - Creating and Working with Virtual Machines - System Virtual Machines - Hypervisor - Hardware Virtualization - Sever Virtualization - Business cases for Sever Virtualization - Uses of Virtual Server Consolidation - Selecting Server Virtualization Platform.

MODULE II NETWORK & STORAGE VIRTUALIZATION 11

Networking for a Virtual Machine – SDN Software Stack – Data-Plane Verification – Testing and Debugging - Network Virtualization - Design of Scalable Enterprise Networks - WAN Virtualization – VLANs - Classical Storage Model - SNIA Shared Storage Model - Host based Architecture - Configuring VM Storage Options -Tuning Practices for VM Storage.

MODULE III DEVICES AND APPLICATIONS IN VIRTUAL MACHINES 9

Using Virtual Machine Tools - Understanding Virtual Devices-Configuring a CD/ DVD Drive - Configuring a Sound Card - Configuring USB Devices - Configuring Graphic Displays - Configuring Other Devices - Deploying Applications in a Virtual Environment - Understanding Virtual Appliances and vApps.

Total Hours : 30

REFERENCES:

1. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.
2. Kumar Reddy, Victor Moreno, “Network virtualization”, Cisco Press, July, 2006.
3. Thomas D.Nadeau and Ken Gray, “SDN: Software Defined Networks”, O’Relly Publications, Kindle Edition, 2013.
4. Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, A Press 2005.

OUTCOMES:

On completion of the course students will be able to:

- Discuss virtualization and analyze types of server virtualization & consolidation.
- Outline network virtualization, SDN paradigm and storage architecture to manage devices and applications in virtual machines.
- Configure and deploy applications in virtual machines.

ITCY211	PROGRAMMING WITH HADOOP	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To make the students familiar with Hadoop distributed file system and can learn how to configure Hadoop.
- To create single node and multinode using Hadoop and to learn programming using Map Reduce paradigm.
- To provide a complete knowledge about Hadoop echo system with key components like Pig, Hive and Sqoop.
- To analyze NOSQL concepts and compare it with RDBMS.
- To explore NoSQL database MongoDB with its basic features.

LIST OF EXERCISES:

1. Introduction to HDFS and Hadoop Ecosystem. Configuration and Installation of Hadoop 1.0 Single node with Name node and Data node.
2. Configuration of Hadoop 1.0 with SSH key for security for Name and Data Node with Demo of Pseudo distributed Node and Case Study of Multinode set up.
3. Study of Map reduce Java API. Simple programs in Map Reduce paradigm with java concepts.
4. Working on Input functions, mapper & reducer functions. Simple program for text extraction and title extraction.
5. Program for searching key word and extract it from the given text paragraph.
6. Program for extracting link from a HTML page using Map and Reduce.
7. Implementation of Pig using Hadoop Ecosystem for processing structured Data.
8. Implementation of Sqoop for transferring schema format to NOSQL format.
9. Implementation and configuration of Hive in Hadoop ecosystem for querying.
10. Installation of Mongo DB and practicing CURD operations in MongoDB.Connecting MongoDB with Hadoop.

OUTCOMES:

On completion of the course students will be able to:

- Demonstrate single node and multinode Hadoop 1.0 with installation and configuration.
- Compute simple programs in Hadoop using Map reduce Paradigm.

- Analyze Hadoop Ecosystem using simple components like Pig, Hive and Sqoop.
- Create SQL and NOSQL Databases and compare processing of data in both.

SEMESTER III PROFESSIONAL ELECTIVES

ITCY101	MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the machine learning theory
- To implement learning models
- To implement distance based clustering techniques
- To build tree and rule based models
- To apply reinforcement learning techniques

MODULE I FOUNDATIONS OF LEARNING 9

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

MODULE II LINEAR MODELS 9

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

MODULE III DISTANCE BASED MODELS 9

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

MODULE IV TREE AND RULE MODELS 9

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.

MODULE V REINFORCEMENT LEARNING 9

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

Total Hours : 45

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.

OUTCOMES:

On completion of the course students will be able to:

- Explain theory underlying machine learning
- Construct algorithms to learning models
- Implement data clustering algorithms
- Construct algorithms to learn tree and rule-based models
- Apply reinforcement learning techniques

ITCY102 **WIRELESS NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn fundamentals of wireless communication.
  To understand the various components of wireless Internet.
- To learn the issues of Ad hoc wireless network and wireless sensor networks.
- To understand the applications of sensor networks.
- To study an awareness of trends and developments in wireless networks.

MODULE I WIRELESS LANS, PANS AND MANS 9

Introduction, fundamentals of WLAN -technical issues, network architecture, IEEE 802.11- physical layer, Mac layer mechanism, CSMA/CA, Bluetooth-specification, transport layer, middleware protocol group, Bluetooth profiles, WLL -generic WLL architecture, technologies, broadband wireless access, IEEE 802.16 -differences between IEEE 802.11 and 802.16,physical layer, data link layer.

MODULE II WIRELESS INTERNET 9

Introduction -wireless internet, address mobility, inefficiency of transport layer and application layer protocol, mobile IP - simultaneous binding, route optimization, mobile IP variations, handoffs, IPv6 advancements, IP for wireless domain, security in mobile IP, TCP in wireless domain - TCP over wireless , TCPs -traditional, snoop, indirect, mobile, transaction- oriented, impact of mobility.

MODULE III AD-HOC WIRELESS NETWORK AND WIRELESS SENSOR NETWOR 9

Introduction, issues in ad-hoc Wireless Networks, Designing a MAC Protocol for adhoc Wireless Networks, Classification of MAC Protocols, Designing a routing protocol for adhoc Wireless Networks, Classification of routing Protocols- Table – Driven, On-demand and Hybrid routing Protocols, ad-hoc wireless internet.

MODULE IV WIRELESS SENSOR NETWORK 9

Introduction - applications of sensor network, comparisons with MANET, issues and design challenges, architecture - layered and clustered , data dissemination, data gathering, Mac protocols, location discovery, quality of sensor network - coverage and exposure, zigbee standard.

MODULE V RECENT ADVANCES IN WIRELESS NETWORK 9

UWB radio communication- operation of UWB systems, comparisons with other technologies, major issues, advantages and disadvantages, Wi-Fi systems- service provider models, issues, interoperability of Wi-Fi and WWAN, multimode 802.11 - IEEE 802.11a/b/g - software radio-based multimode system, meghadoot architecture -802.11 phone, fundamentals of UMTS.

Total Hours : 45

REFERENCES:

1. C.Siva Ram Murthy and B.S. Manoj, “Ad-hoc wireless networks-architecture and protocols”, Pearson education, 2nd, 2005.

2. Jochen Schiller, 'Mobile Communication', Pearson education, 2nd edition 2005.

3. WIlliam Stallings, 'Wireless Communication and Networks', Prentice Hall, 2nd edition,2005

OUTCOMES:

On completion of the course students will be able to:

- Identify the basic concept of wireless networks;
- Identify and fix the vulnerabilities in different types of wireless networks as MANETS and WSN.
- Demonstrate knowledge of protocols used in wireless communications
- Classify network protocols, ad hoc and sensor networks, wireless MANs, LANs and PANs;
- Design, deploy and manage wireless local area networks.

ITCY103 **ENTERPRISE RESOURCE PLANNING** **L T P C**
3 0 0 3

OBJECTIVES:

- To build an understanding of the fundamental business processes used to runcompanies with a focus on supply chain processes.
- To expose the students to the implementation issues and future trends
- associated with ERP
- To provide hands on exposure to a live ERP system, achieving an intermediate level of comfort using SAP ERP enterprise software.
- To learn how to effectively analyze information from an ERP system to make business decisions

MODULE I INTRODUCTION TO ERP **9**

Overview - Benefits of ERP - ERP and Related Technologies – Business Process Reengineering - Data Warehousing - Data Mining - On-line Analytical Processing - Supply Chain Management.

MODULE II ERP IMPLEMENTATION **9**

Implementation Life Cycle - Implementation Methodology - Hidden Costs - Organizing Implementation - Vendors, Consultants and Users - Contracts - IT91 Project Management and Monitoring.

MODULE III BUSINESS MODULES **9**

Business Modules in an ERP Package - Finance - Manufacturing – Human Resource - Plant Maintenance - Materials Management - Quality Management- Sales and Distribution.

MODULE IV ERP MARKET **9**

ERP Market Place - SAP AG - PeopleSoft - Baan Company - JD Edwards World Solutions Company - Oracle Corporation - QAD - System Software Associates.

MODULE V ERP - PRESENT AND FUTURE **9**

Turbo Charge the ERP System - EIA - ERP and E-Commerce - ERP and Internet - Future Directions in ERP

Total Hours : 45

REFERENCES:

1. Alexis Leon, Enterprise Resource Planning, second edition, Tata McGraw-Hill, 2008.
2. Alexis Leon, ERP demystified, second Edition Tata McGraw-Hill, 2006.

3. Jagan Nathan Vaman, ERP in Practice, Tata McGraw-Hill, 2008

4. Vinod Kumar Grag and N.K. Venkitakrishnan, ERP- Concepts and Practice, Prentice Hall of India,2 nd edition, 2006.

OUTCOMES:

On completion of the course students will be able to:

- Apply the process modeling techniques in one or more modeling environments.
- Know and be able to apply key technical terminology different ERP products and development methods.
- Understand key differences between the major ERP applications (such as SAP R/3, and Oracle/PeopleSoft/Sibel) and issues specific to these applications their configuration and management.
- Synthesize prior theoretical and experiential knowledge in IT development and project management with the current literature on Enterprise System development.
- Be able to evaluate the progress of an ongoing ERP implementation project.

ITCY104	WEB DESIGN AND MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To familiarize the web page authoring fundamentals.
- To explore the web languages using client side script.
- To demonstrate and configure web servers and discuss about services.
- To design the website with different designing methodology.
- To publish the website by applying design technologies.

MODULE I WEB PAGE AUTHORING FUNDAMENTALS 9

Introduction to Web Site Development -Markup Language and Site Development Essentials-XHTML Coding - Elements -Hyperlinks -Tables -Web Forms -Image Techniques -Frames -GUI HTML 5 Editors- Introduction to Networking -TCP/IP Suite and Internet Addressing.

MODULE II WEB LANGUAGES 9

JavaScript Introduction -Functions, Methods and Events -Program Flow -Object Model - Browser Objects -Language Objects -Interactive Forms -Cookies and JavaScript Security -Client-Side JavaScript Getting Started with Perl- Intro-Arrays - Matching and Substitution -Subroutines – References-Packages –Modules-J query - Bootstrap - Angular Java Script.

MODULE III SERVICES, SERVERS, INTEGRITY 9

Web servers - IIS & Apache -Windows 2000 DNS Server -Configuring DNS in Windows NT – NetBIOS -Managing WINS -Introduction to FTP -Virtual FTP Servers -FTP Access -Telnet -Xinetd - Web Applications -Perl and E-Commerce Web Servers -Web Servers and Gateways Web Server and Gateway Overview -Streaming Media Servers -Configuring a News Server -Optimizing Servers- Introduction to Security -SSL -Proxy Servers -Introduction to Fault Tolerance -Disaster Assessment and Recovery

MODULE IV DESIGN METHODOLOGY 9

Overview of Web Design Concepts -Web Project Management Fundamentals -Web Page Layout and Elements -Web Site Usability and Accessibility -Navigation Concepts -Web Graphics - Multimedia and The Web -Ethical and Legal Issues in Web Development -XML and XHTML -Web Page Structure - Tables and Framesets -Cascading Style Sheets -Site Content and Metadata - JSON.

MODULE V DESIGN TECHNOLOGY 9

Development with Macromedia Dream weaver 10 - Advanced Features -Image Editing with Macromedia Fireworks -Multimedia with Macromedia Flash 11 - Timeline, Layers, Symbols and Buttons - Tweens - Movie Clips - Action script, Masks and Practical Uses -JavaScript and DHTML Fundamentals -Plus-ins and Java Applets -HTTP Servers and Web Applications -Databases -Web Site Publishing and Maintenance.

Total Hours : 45

REFERENCES:

1. L.Mohler, Flash 8 Graphics, 'Animation and Interactivity by James', Onword Press, Thomson Learning, 2006.
2.H. M. Deitel**,** P. J. Deitel and T. R. Nieto– How to program', PHI/Pearson Education Asia, November 2011**.**
3.William Stallings, 'Data and Computer Communications', Pearson, 2007
4. Jason Hunter and William Crawford, 'Java Servlet Programming', O'Reilly Pub1999.
5.Anders Miller, Michael Schwartzbach, 'An Introduction to XML and Web Technologies', Addison Wesley, 2006.

OUTCOMES:

On completion of the course students will be able to:

- Discuss the web authoring fundamentals.
- Demonstrate web languages and implement client side scripting.
- Configure web servers and evaluate services.
- Design the website by using specific methodologies.
- Publish the website by applying design technologies.

ITCY105	DESIGN PATTERNS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explore the overview of patterns, prototyping and testing.
- To familiarize with different kinds of design patterns.
- To analyze the use of pattern algorithms in software engineering.
- To use the patterns in real world applications with the help of case study.
- To apply case study examples in UML.

MODULE I INTRODUCTION **9**

History and origin of patterns – Applying Design Patterns - Prototyping - Testing.

MODULE II DESIGN PATTERNS **9**

Kinds of pattern - Quality and elements - patterns and rules - Creativity and patterns – Creational patterns – Structural Patterns – Behavioral Patterns - Factory Patterns.

MODULE III FRAMEWORKS **9**

State and Strategy of Patterns, Singleton, Composite, Functions and the Command Patterns, Adaptor, Proxy Patterns, Decorator Pattern – Pattern Frameworks and Algorithms.

MODULE IV CATALOGS **9**

Pattern catalogs and writing patterns, Patterns and Case Study.

MODULE V ADVANCED PATTERNS **9**

Anti-patterns - Case studies in UML and CORBA, Pattern Community.

Total Hours : 45

REFERENCES:

1. Eric Gamma, Richard Helm, Ralph Johnson, John Vissides, Grady Booch, “Design Patterns: Elements of Reusable Object-Oriented Software”, 2002.
2. James W-Cooper, “Java Design Patterns – A Tutorial”, Addison Wesley 2000.
3. Craig Larman, ‘Applying UML and Patterns: “An Introduction to Object-Oriented Analysis and Design’, and the Unified Process”, 2nd edition, Prentice Hall, 2001.
4. Thomas Mowbray and Raphel Malveaux, “CORBA and Design Patterns”, John Wiley, 1997.
5. William J Brown et al. “Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis”, John Wiley, 1998.

OUTCOMES

On completion of the course students will be able to:

- Discuss the overview of design patterns in software engineering.
- Use different kinds of patterns and its features.
- Compare frameworks and patterns and compute pattern algorithm.
- Apply pattern catalogs and practice case study.
- Use patterns in UML.

ITCY106	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of data warehousing architecture and implementation.
- To study the data mining principles and techniques.
- To learn to use association rule mining for handling large data sets.
- To know the concepts of classification for the retrieval process.
- To understand the clustering techniques for different methods.
- To identify business applications and trends in data mining.

MODULE I DATA WAREHOUSE & BUSINESS ANALYSIS 9

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

MODULE II DATA MINING & DATA PREPROCESSING 9

Introduction to KDD process - Knowledge Discovery from Databases - Classifications of Data Mining Systems - Need for Data Preprocessing - Data Cleaning - Data Integration and Transformation - Data Reduction - Data Discretization - Data Generalization and Concept Hierarchy Generation.

MODULE III ASSOCIATION RULE MINING 9

Association Rule Mining - Mining Frequent Item sets with and without Candidate Generation - Mining Various Kinds of Association Rules - Single and Multi-Level Association Rules from Transaction Databases - Correlation Analysis - Constraint Based Association Mining - Advanced Association Rule Techniques

MODULE IV CLASSIFICATION & PREDICITION 9

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 - Lazy Learners - Other Classification Methods - Prediction - Evaluating the Accuracy of a Classifier or Predictor - Ensemble Methods - Model Section.

MODULE V CLUSTERING & TRENDS IN DATA MINING 9

Cluster Analysis - Types of Data in Cluster Analysis - 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 – Data Mining Applications.

Total Hours : 45

REFERENCES:

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Pearson Education, 2007.
3. Alex Bezon, Stephen J.Smith, 'Data Warehousing, Data Mining & OLAP', McGraw-Hill Edition, 2001.
4. Paulraj Ponniah, 'Data Warehousing Fundamentals', J o h n Wiley & Sons, New Delhi, 2012.

OUTCOMES:

On completion of the course students will be able to:

- Analyze the concepts of data warehousing and architecture.
- Discuss data mining principles and techniques and preprocess the data for mining applications.
- Apply association rules for mining the data.
- Outline appropriate classification and prediction methods.
- Discuss clustering methods for high-dimensional data and analyze data mining applications on modern organization.

ITCY107	WIRELESS & MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the different cellular systems and their advancements from one generation to other.
- To know the different basic propagation mechanisms.
- To have a knowledge about designing a mobile system.
- To recognize various multipath propagation models
- To study the various mobile modulation and demodulation techniques.
- To realize how to alleviate fading effects, and multiple access techniques

MODULE I INTRODUCTION TO MOBILE COMMUNICATION SYSTEMS 9

Evolution of Mobile Radio Communications – Present Day mobile communication – Fundamental Techniques – How a mobile call is made? – Modern Mobile communication systems – 1G, 2G, 3G, Beyond 3G – Wireless Transmission Protocols.

MODULE II MOBILE SYSTEM DESIGN FUNDAMENTALS AND RADIO WAVE PROPAGATION 9

What is a cell? – Frequency reuse – Channel assignment strategies – Handoff strategies – Interference and system capacity – Trunking and Grade of service – Improving coverage and capacity in cellular systems – Free Space Propagation Model – The Three Basic Propagation Mechanisms: Reflection , Diffraction and Scattering – Link Budget Design – Outdoor Propagation Models – Indoor Propagation Models.

MODULE III WAVE PROPAGATION AND FADING 9

Multipath Propagation – Multipath and Small Scale Fading – Types of Small Scale Fading – Multipath Channel Parameters – Statistical Models for Multipath Propagation – Simulations of Clarke and Ganes Fading Model.

MODULE IV MOBILE MODULATION TECHNIQUES 9

Amplitude Modulation – Angle Modulation – Digital Modulation – Line coding – Pulse Shaping Techniques – Linear Modulation Techniques – Spread Spectrum Modulation Techniques – Modulation Performance in Fading and Multipath Channels.

MODULE V TECHNIQUES TO ALLEVIATE FADING EFFECTS AND MULTIPLE ACCESS TECHNIQUES 9

Equalization: – Linear and Non-linear Equalization – Algorithms for Adaptive Equalization Diversity: Polarization Diversity, Frequency Diversity, Time Diversity – Channel Coding: Fundamentals, Block Codes, Convolutional Codes, Coding Gain – Multiple Access Techniques: FDMA, TDMA, SSMA, SDMA.

REFERENCES:

1. Theodore S. Rappaport, " Wireless Communications Principles and Practice", Second Edition, Pearson, 2010.
2. Andreas F.Molich, "Wireless Communications", Second Edition, John Wiley, 2011.
3. Jorge L.OleneWA, "Guide to Wireless Communications", Third Edition, Cengage Learning, 2014.
4. Cory Beard and William Stallings, "Wireless Communication Networks and Systems", First Edition, Pearson, 2015.
5. Nishith Tripathi and Jeffrey H. Reed , "Cellular Communications: A Comprehensive and Practical Guide", Wiley, 2014.

OUTCOMES:

On completion of the course students will be able to:

1. Explain the fundamentals of cellular radio system design and increase the coverage capacity.
2. Discuss various multipath propagation models and different types of fading.
3. Demonstrate various mobile transmitter and receiver techniques.
4. Apply various techniques to mitigate fading effects.
5. Compare and contradict various multiple access techniques.

ITCY108	SOFTWARE METRICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To be aware of Core metrics for product, quality, process.
- To familiarize with the concepts of Software quality and tools for quality metrics.
- To learn more about software reliability.
- To understand important concepts of complexity metrics and OO metrics.
- To analyze and identify metrics for software project.

MODULE I MEASUREMENTS THEORY **9**

Fundamentals of measurement - Measurements in Software Engineering - Scope of Software metrics - measurements theory - Goal based framework - Software Measurement validation.

MODULE II DATA COLLECTION AND ANALYSIS **9**

Empirical investigation - Planning experiments - Software metrics data Collection - Analysis methods - statistical methods.

MODULE III PRODUCTS METRICS **9**

Measurement of internet product attributes - size and structure - External product attributes - measurement of quality.

MODULE IV QUALITY METRICS **9**

Software quality metrics - Product quality - Process quality - metrics forsoftware maintenance - Case studies of Metrics program - Motorola - Hp and IBM.

MODULE V MANAGEMENT METRICS **9**

Quality management models - Rayleigh Model - Problem Tracking report (PTR) model - Reliability growth model - model evaluation - Orthogonal classification.

Total Hours : 45

REFERENCES:

1. Norman E - Fentar and Share Lawrence Pflieger, 'Software metrics', International Thomson Computer Press, 2013.
2. Norman Fenton, James Bieman, "Software Metrics: A Rigorous and Practical Approach", 3rd edition, CRC Press, 2015
3. Stephen H.Kan, 'Metric and models in software quality engineering', 2nd edition, Addison Wesley 2003
4. William A. Florac and Areitor D. Carletow, 'Measuring Software Process', Addison - Wesley, 1999.

OUTCOMES:

On completion of the course students will be able to:

- Explain the concept of measurement theory
- Collect the data to measure metrics and analyze the metrics
- Identify the software product metrics
- Outline the software quality metrics
- Develop the software management metrics

ITCY109	SECURITY IN BIG DATA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce security problem in computing and cryptography, and uses of Encryption.
- To explore about program security, non-malicious code and control against Program threats.
- To analyze the XML Encryption and security.
- To identify security challenges in distributed system and analyze various policies and guidelines to meet the challenges for securing data.
- To discuss the security in analytics and to identify secure provisioning in Hadoop.
- To demonstrate the security in various components of hadoop eco system.

MODULE I DATA SECURITY OVERVIEW - CRYPTOGRAPHY 9

Security problem in computing- Elementary Cryptography-Symmetric Key Encryption –Public Key Encryption-Uses of Encryption.

MODULE II DATA SECURITY -PROGRAM AND XML SECURITY 9

Security Programs-Non-Malicious program errors-Virus and other Malicious Code- Targeted Malicious Code-Control against program threats. Security Overview in XML – Canonicalization-XML security framework- XML encryption-XML Digital Signature.

MODULE III SECURITY IN DISTRIBUTED SYSTEMS 9

Security in DFS -Threat Categories – Unauthorized access-Risk assessment-Vulnerabilities – System Architecture- Operating environment – Network security – Network segmentation-Intrusion detection and prevention – Operating system security-Kerberos – Workflow-Identity theft – Authentication and Authorization.

MODULE IV DATA SECURITY IN BIGDATA ANALYTICS 9

Introduction to security in analytics –Data for security analytics -Security analytics process –Incident response and Intrusion Detection – Security and Text Mining – Simulations and Security process-Access Analytics.

MODULE V HADOOP SECURITY 9

Overview of Hadoop security – Hadoop components and Ecosystem – Authentication – Provisioning of Hadoop users – Hadoop users to group mapping-Mapping Kerberos principles to usernames – HDFS authorization-Map reduce and yarn authorization – Oozie authorization – Hbase authorization – Data protection in Hadoop- Case Study in Hadoop security.

Total Hours : 45

REFERENCES:

1.Charles B, Pfleeger, Shari LawerencePfleeger, Third Edition, “Security in Computing”, Pearson Education, 2003.

2. Frank P.Coyle, “XML, Web Services and the Data Reveloution”, Pearson Education, 2002.

3. Mark Talabis , Robert McPherson , Inez Miyamoto , Jason Martin Information Security Analytics: Finding Security Insights, Patterns, and Anomalies in Big Data, Syngress, Elseveir, 2015.

4.Ben Spivey Joey Echeverria,Hadoop Security: Protecting Your Big Data Platform ,!st Edition, Orielly, 2015.

5. Tim Mather, SubraKumaraswamy, and ShahedLatif “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance”, O’Reilly Media Inc, 2009.

OUTCOMES:

On completion of the course students will be able to:

- To explain basics of Security problems in Big data and Hadoop.
- To compare XML Security with program security with pros and cons.
- To outline the security challenges in bigdata and the standards which are used to meet the
- Challenges.
- To analyze security in various Hadoop components and apply it to case study.
- To utilize the security techniques and apply it in a real time project.

ITCY110 MULTIMEDIA COMMUNICATION AND NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics concepts of multimedia communications.
- To study the technical issues and system solutions for providing multimedia communications on the Internet.
- To understand the Multimedia Communication Models
- To explore real-time multimedia network applications.

MODULE I IP NETWORKS **9**

Open Data Network Model – Narrow Waist Model of the Internet - Success and Limitations of the Internet – Suggested Improvements for IP and TCP – Significance of UDP in modern Communication – Network level Solutions – End to End Solutions - Best Effort service model – Scheduling and Dropping policies for Best Effort Service model

MODULE II ADVANCED ROUTING **9**

Intra AS routing – Inter AS routing – Router Architecture – Switch Fabric – Active Queue Management – Head of Line blocking – Transition from IPv4 to IPv6 – Multicasting – Abstraction of Multicast groups – Group Management – IGMP – Group Shared Multicast Tree – Source based Multicast Tree – Multicast routing in Internet – DVMRP and MOSPF – PIM – Sparse mode and Dense mode

MODULE III GUARANTEED SERVICE MODEL **9**

Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters – Quality of Service and metrics – WFQ and its variants – Random Early Detection – QoS aware Routing – Admission Control – Resource Reservation – RSVP - Traffic Shaping Algorithms – Caching – Laissez Faire Approach - Possible Architectures - An Overview of QoS Architectures

MODULE IV MULTIMEDIA COMMUNICATION **9**

Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications - Streaming of Audio and Video – Jitter – Fixed playout and Adaptive playout – Recovering from packet loss – RTSP –– Multimedia Communication Standards – RTP/RTCP – SIP and H.263

MODULE V WIRELESS MULTIMEDIA COMMUNICATION **9**

End to End QoS provisioning in Wireless Multimedia Networks – Adaptive Framework – MAC layer QoS enhancements in Wireless Networks – A Hybrid MAC protocol for Multimedia Traffic – Call Admission Control in Wireless Multimedia Networks – A Global QoS Management for Wireless Networks.

Total Hours : 45

REFERENCES:

1. Jean Warland and Pravin Vareya, 'High Performance Networks', Morgan Kauffman Publishers, 2002
2. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2004.
3. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.
4. Nalin K Sharda, 'Multimedia Information Networking', Prentice Hall of India, 1999
5. Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, 'Multimedia Wireless Networks: Technologies, Standards and QoS', Prentice Hall, 2003.
6. Ellen Kayata Wesel, 'Wireless Multimedia Communications: Networking Video, Voice and Data', Addision Wesley, 1998

OUTCOMES:

On completion of the course students will be able to:

- Outline the current state-of-the-art developments in Internet technologies for multimedia communications and deploy the right multimedia communication models
- Identify different routing techniques
- Discuss the guaranteed service model
- Solve the security threats in the multimedia networks
- Apply QoS to multimedia network communication

ITCY111	AD-HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce the issues related with MAC protocols Ad-Hoc and wireless sensor networks.
- To discuss the various routing protocols used in Ad-Hoc and wireless sensor networks.
- Knowledge of sensor networks and their characteristics. This includes design of MAC layer protocols.
- To introduce the concept of QOS.
- To provide an overview of the various Mesh networks and the issues in them.

MODULE I AD-HOC MAC **9**

Introduction – Issues in Ad-Hoc Wireless Networks. MAC Protocols – Issues, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

MODULE II AD-HOC NETWORK ROUTING & TCP **9**

Issues – Classifications of routing protocols – Hierarchical and Power aware. Multicast routing – Classifications, Tree based, Mesh based. Ad Hoc Transport Layer Issues. TCP Over Ad Hoc – Feedback based, TCP with explicit link, TCP-BuS, Ad Hoc TCP, and Split TCP.

MODULE III WSN –MAC **9**

Introduction – Sensor Network Architecture, Data dissemination, Gathering. MAC Protocols – self-organizing, Hybrid TDMA/FDMA and CSMA based MAC.

MODULE IV WSN ROUTING, LOCALIZATION & QOS **9**

Issues in WSN routing – OLSR, AODV. Localization – Indoor and Sensor Network Localization. QoS in WSN.

MODULE V MESH NETWORKS **9**

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.

Total Hours : 45

REFERENCES:

1. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2004.

2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.

3. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education, 2002. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.

OUTCOMES:

On completion of the course students will be able to:

- Explain the concept of Ad-Hoc and wireless sensor networks.
- Identify the design issues related with MAC protocols in Ad-Hoc and wireless sensor networks.
- Understand and explain issues related with routing protocols in Ad-Hoc and wireless sensor networks.
- Understand the necessity of various Mesh Networks.
- Understand the limitations of wireless sensor networks and the workarounds needed to develop real-life applications

ITCY112	ONTOLOGY AND SEMANTIC WEB	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To introduce semantic web and ontology architectures.
- To familiarize with the languages for semantic web and ontologies.
- To analyze the use of ontology in semantic web.
- To demonstrate the use of tools for ontology.
- To apply the ontology and semantic web in real time applications.

MODULE I INTRODUCTION 8

Components – Types – Ontological Commitments – Ontological Categories – Philosophical Background -Sample - Knowledge Representation Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web – Need – Foundation – Layers – Architecture.

MODULE II LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES 12

Web Documents in XML – RDF - Schema – Web Resource Description using RDF- RDF Properties – Topic Maps and RDF – Overview – Syntax Structure – Semantics – Pragmatics - Traditional Ontology Languages – LOOM- OKBC – OCML – Flogic Ontology Markup Languages – SHOE – OIL - DAML + OIL- OWL.

MODULE III ONTOLOGY LEARNING FOR SEMANTIC WEB 12

Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning – Importing and Processing Ontologies and Documents – Ontology Learning Algorithms - Evaluation.

MODULE IV ONTOLOGY MANAGEMENT AND TOOLS 8

Overview – need for management – development process – target ontology – ontology mapping – skills management system – ontological class – constraints – issues. Volution – Development of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

MODULE V APPLICATIONS 5

Web Services – Semantic Web Services - Case Study for specific domain – Security issues – current trends.

Total Hours : 45

REFERENCES:

1. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez "Ontological Engineering: with examples from the areas of Knowledge Management, e- Commerce and the Semantic Web" Springer, 2004
2. Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004
3. Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002
4. John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology – Driven Knowledge Management", John Wiley & Sons Ltd., 2003.
5. John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) "Semantic Web Technologies: Trends and Research in Ontology-based Systems"Wiley Publications, Jul 2006
6. Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, "Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential",The MIT Press, 2002.
7. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Wiley, 2003.
8. Steffen Staab (Editor), Rudi Studer, "Handbook on Ontologies (International Handbooks on Information Systems)", Springer 1st edition, 2004.
9. Dean Allemang (Author), James Hendler (Author) "Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL" (Paperback), Morgan Kaufmann, 2008.

OUTCOMES:

On completion of the course students will be able to:

- Outline the architectures of semantic web and ontology.
- Utilize the languages used for ontology and semantic web.
- Analyze the use of ontology in semantic web.
- Use tools for ontology and semantic web.
- Apply the semantic web and ontology in web services.

ITCY113	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the basic concepts of software project management and software estimation methods.
- To know the software cost estimation methods.
- To learn how to allocate resources for software projects.
- To learn how to manage a project
- To manage peoples

MODULE I PROJECT MANAGEMENT CONCEPT 9

Evolution of Software Economics – Improving Software Economics – Life-Cycle Phases – Manage People – Implement Process – Leverage Tools – Utilize Measurements

MODULE II SOFTWARE ESTIMATION & COSTING 10

Form Vision - Algorithmic Cost Estimation Process, Function Points, SLIM (Software Life cycle Management), COCOMO II(Constructive Cost Model) – Estimating Web Application Development – Organize Resources – Sketch Schedule – Write Plan.

MODULE III RISK MANAGEMENT 7

Risk Definition – Risk Categories – Risk Assessment (Identification / Analysis / Prioritization) – Risk Control (Planning / Resolution / Monitoring) – Failure Mode and Effects Analysis (FMEA)

MODULE IV SOFTWARE PROJECT MANAGEMENT 10

Monitor Project – Engineer a Great Product – Deliver System – Assess Project – Managing Global Software Projects

MODULE V PEOPLE MANAGEMENT 9

PCMM – Team Management – Motivating Software Engineers Working in Virtual Teams Across Glob – Agile Project management

Total Hours : 45

REFERENCES:

1. Günther Ruhe, Claes Wohlin, “Software Project Management in a Changing World, Springer-Verlag, 2014
2. Bob Hughes,Mike Cotterell,Rajib Mall, “Software Project Management “, 5th edition, Tata McGraw-Hill Education Pvt. 2011
3. Roger S. Pressman, “software engineering” 7th edition, Mc Graw Hill Education, 2014
4. Royce, W. “Software Project management: A Unified Framework”, Addison- Wesley, 1998.
5. Joel Henry, “Software Project Management: A Real-World Guide To Success”, Pearson Education, 2004

OUTCOMES:

On completion of the course students will be able to :

- Explain the software project management concepts
- Estimate the cost and prepare project plan document.
- Identify and analyze risks.
- Express how to manage projects
- Lead a team and manage the people

ECCY001 DIGITAL IMAGE PROCESSING L T P C

3 0 0 3

OBJECTIVES:

- Describe and explain basic principles of digital image processing;
- Design and implement algorithms that perform basic image processing
- Design and implement algorithms for advanced image analysis
- Assess the performance of image processing algorithms and systems.

MODULE I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Basics of visual perception, Psycho, visual model, Color image fundamentals, Brightness, contrast, hue, saturation, GB,HSI models, Image sampling & quantization.

MODULE II IMAGE TRANSFORMS 9

2D discrete transforms, DFT, DCT, WHT, KLT, DWT, Simulation of 2D transform by 1D transform.

MODULE III IMAGE ENHANCEMENT, RESTORATION, SEGMENTATION & RECOGNITION 12

Histogram modification and specification techniques, Noise distributions, Low and High Pass filters, Color image enhancement, Image degradation model – Unconstrained and constrained restoration, Geometric transformations, Spatial transformations, Gray level interpolation, Image Segmentation & its types, Pattern and Pattern classes.

MODULE IV IMAGE COMPRESSION 8

Need for image compression, Vector Quantization, Run Length Encoding, Shiftcodes, Block Truncation Coding, DCT and Wavelet Transform coding, Simulation of basic concepts.

MODULE V IMAGE PROCESSING APPLICATIONS 7

Biometric identification, Satellite image processing, Industrial machine vision application, Neural Networks in image processing, Medical image processing and Motion Analysis, Augmented\Virtual reality.

Total Hours : 45

REFERENCES:

1. Rafael C. Gonzalez, Richard E.Woods, Digital Image Processing, Pearson
2. Education, Inc., Second Edition, 2004
3. Anil K. Jain, Fundamentals of Digital Image Processing, Prentice Hall of India, 2002.
4. David Salomon : Data Compression The Complete Reference, Springer Verlag New York Inc., 2nd Edition, 2001
5. Rafael C. Gonzalez, Richard E.Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2004.
6. William K.Pratt, Digital Image Processing, John Wiley, NewYork, 2002
7. G.W.Awcock & R.Thomas,Applied Image Processing,Mc Graw-Hill Inc,1996
8. Sonka,Hlavac,Boyle,Digital Image Processing and Computer Vision, Cengage Learning, India, 2008 Edition
9. Madhuri A.Joshi, Digital Image Processing-An Algorithmic approach, Prentice Hall of India, 2008

OUTCOMES:

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

- Acquire the knowledge of fundamental concepts of a digital image processing system
- Analyze 2D signals in the frequency domain through the various transforms.
- Describe various techniques for image enhancement and restoration.
- Recognize and apply suitable image segmentation techniques
- Identify and use of appropriate image compression techniques.
- Implement concepts of image processing using simulation technique.
- Apply suitable image processing techniques for various applications

ITCY114	HUMAN COMPUTER INTERFACE	L	T	P	C
		2	0	0	2

OBJECTIVES:

- To understand the concept of menus, windows, interfaces and business functions.
- To know the various characteristics and components of windows.
- To study about various problems in windows design with color, text, graphics.

MODULE I HUMAN COMPUTER INTERACTION **10**

Introduction-Importance- Human -Computer interface - characteristics of graphics interface- web user interface- characteristic & principles. User interface design process- obstacles -human characteristics in design - Human interaction speed-business functions-requirement analysis- basic business functions- Human consideration in screen design

MODULE II WINDOWS **10**

Structures of menus - functions of menus -contents of menu -formatting - phrasing the menu - selecting menu choice-navigating menus -graphical menus- Windows: Characteristics –components -presentation styles -types- managements –organizations –operations -web systems

MODULE III MULTIMEDIA **10**

Device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control- Text for web pages – Icons -Image -Multimedia –coloring- Windows layout-test: prototypes - kinds of tests – retest.

Total Hours: 30

REFERENCES:

1. Wilbent. O. Galitz ,"The Essential Guide to User Interface Design", John Wiley& Sons, 2001.
2. Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd., 2002.
3. Sharp, Rogers, Preece, "Interaction Design", Wiley India, 2007.
4. Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.

OUTCOMES:

On completion of the course students will be able to:

- Identify design elements from analysis of existing interfaces
- Use HCI concepts and principles to design and implement user interfaces for new applications
- Practical experience in iterative, user-centered design of graphical user interfaces and evaluate interface designs

ITCY115	DATA SCIENCE AND ANALYTICS	L	T	P	C
		2	0	0	2

OBJECTIVES

- To explore the fundamental concepts of big data analytics.
- To learn the life cycle of data analytics
- To analyze the big data using intelligent techniques.

MODULE I INTRODUCTION TO BIG DATA 10

Introduction to BigData Platform – Analyst perspective on data repository-BI versus Data science- Current Analytical architecture- Drivers of Big Data- Emerging Big Data Ecosystem and a New Approach to Analytics- Examples of Big Data .

MODULE II DATA ANALYTICS LIFECYCLE 10

Data Analytics Lifecycle Overview- Key Roles for a Successful Analytics Project- Discovery- Data Preparation- Model Planning – Model Building – Communicate Results- Operationalize- Case Study: Global Innovation Network and Analysis (GINA).

MODULE III DATA ANALYTIC METHODS 10

Introduction to R 64- R Graphical User Interfaces- Data Import and Export- Attribute and Data Types- Descriptive Statistics – Descriptive Statistics- Exploratory Data Analysis – Visualization Before Analysis 8- Dirty Data – Visualizing a Single Variable- Examining Multiple Variables- Statistical Methods for Evaluation- Hypothesis Testing.

Total Hours-30

REFERENCES:

1. "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", EMC Education Services, Wiley, 2015
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
4. PeteWarden, "Big Data Glossary", O'Reilly, 2011.

OUTCOMES

On completion of the course students will be able to:

- Explain the fundamentals of various big data analytics techniques.
- Deploy a structured lifecycle approach to data analytics problems
- Apply appropriate analytic techniques and methods for analyzing big data

ITCY116	BIG DATA ANALYTICS TOOLS	L	T	P	C
		1	0	0	1

OBJECTIVES

- To understand the basics concepts of text analysis methods.
- To know the framework applications on big data tools.

MODULE I ADVANCED ANALYTICAL THEORY AND METHODS-TEXT ANALYSIS **8**

Text Analysis Steps- A Text Analysis Example- Collecting Raw Text- Representing Text- Term Frequency—Inverse Document Frequency (TFIDF)- Categorizing Documents by Topics- Determining Sentiments- Gaining Insights-exercises.

MODULE II TECHNOLOGY AND TOOLS **7**

Analytics for Unstructured Data - Use Cases - MapReduce - Apache Hadoop - The Hadoop Ecosystem – Hive – HBase –Flume- Mahout – Apache Spark- SOLR-NoSQL.

Total Hours- 15

REFERENCES:

1. “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, EMC Education Services, Wiley, 2015
2. Tom White “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

OUTCOMES

On completion of the course students will be able to:

- Design efficient algorithms for mining the data from large volumes.
- Explore on Big Data applications Using Pig and Hive.

ITCY117 GREEN TECHNOLOGY L T P C
1 0 0 1

OBJECTIVES:

- To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- To learn to minimize energy consumption.
- To examine technology for energy management in real-time systems.

MODULE I GREEN IT FUNDAMENTALS, ASSETS & MODELING 7

Green IT Fundamentals: Business, IT, Environment - Green IT Strategies: Drivers, Dimensions, Goals - Green Assets: Buildings, Data Centers, Networks, and Devices - Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture - Green Information Systems: Design and Development Models – Power management in power-aware real time systems – Green Applications.

MODULE II GREEN IT FRAMEWORK & GREEN COMPLIANCE 8

Data center virtualization – Implementing Green Data Center – Saving energy –Enabling transparency, Telecommuting, Teleconferencing and Teleporting – Going paperless - Materials recycling – Green Data center – Green Grid framework – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

Total Hours : 15

REFERENCES:

1. Bud E. Smith,"Green Computing Tools and Techniques for Saving Energy, Money, and Resources", Taylor & Francis Group, CRC Press, ISBN-13: 978-1-4665-0340-3, 2014.
2. Jason Harris, "Green Computing and Green IT Best Practices, On Regulations and Industry Initiatives, Virtualization and power management, materials recycling and Tele commuting , Emereo Publishing .ISBN-13: 978-1-9215-2344-1,2014.
3. Ishfaq Ahmed & Sanjay Ranka, "Handbook of Energy Aware and Green Computing", CRC Press, ISBN: 978-1-4665-0116-4, 2013.
4. Greg Schulz, "The Green and Virtual Data Center", CRC Press, ISBN-13:978-1-4200-8666-9, 2009.
5. Marty Poniatowski, "Foundation of Green IT: Consolidation, Virtualization, Efficiency, and ROI in the Data Center", Printice Hall, ISBN: 9780-1-3704-375-0, 2009.

OUTCOMES:

On completion of the course students will be able to:

- Discuss Green Computing concepts, assets and business process management.
- Outline Green data center framework, Green compliance in IT systems.

ITCY118 BLOCKCHAIN ARCHITECTURE AND USE CASES L T P C

3 0 0 3

OBJECTIVES:

- To have a fundamental understanding of Blockchain, its historical perspective and its architecture
- To understand the design issues and consensus in permission-less and permissioned Blockchain models
- To grasp the concepts, benefits and design of blockchain frameworks such as hyperledger fabric and hyperledger composer.
- To realize the impact of Blockchain in various areas
- To comprehend how the business through blockchain is secured

MODULE I INTRODUCTION TO BLOCKCHAIN 09

Blockchain -Blockchain as public ledgers- Evolution of Blockchain – Cryptographically secured Blockchain - Blockchain 2.0 - Smart Contracts – Block in a Blockchain- Distributed Consensus - Cryptocurrency - Digital Signature

MODULE II PERMISSION-LESS AND PERMISSIONED BLOCKCHAIN MODELS 09

Permission-less model: Bitcoin- Bitcoin Scripts - Transaction in Bitcoin - Consensus in a Bitcoin - Bitcoin Miner –Mining Difficulty - Mining Pool - Permissioned Blckchain: model and use cases - Design issues - Consensus models - Byzantine general problem

MODULE III BLOCKCHAIN FRAMEWORKS 09

Blockchain for enterprise: Concepts and benefits- The Hyperledger Project - Hyperledger Fabric: Transaction Flow - Fabric Membership and Identity Management - Hyperledger Fabric Network Setup, Hyperledger Composer: Application Development - Network Administration.

MODULE IV BLOCKCHAIN SERVICES 09

Blockchain in Financial Service - Blockchain enabled Trade - Supply Chain Financing - Revolutionizing Global Trade - Blockchain in Supply Chain - Blockchain in Healthcare - Blockchain in Energy Markets - Blockchain in Media - Preventing Cyber Crime through blockchain - Blockchain for Defense - Blockchain for Tax Payments – Blockchain for Managing Land Registry Records.

MODULE V BLOCKCHAIN SECURITY 09

Security considerations for Blockchain - Blockchain Crypto Service Providers - Privacy in a Blockchain System - Smart Contract Confidentiality - PoW vs BFT Consensus - Consensus Finality and Scalability - Fairness and Scalability in Nakamoto Consensus - Authority and Digital Signatures.

Total : 45 Hours

TEXT BOOKS:

1. Melanie Swan “Blockchain - Blueprint for a New Economy“ 2015, published by O’Reilly Media.
2. Andreas M. Antonopoulos “Mastering Bitcoin” 2016, published by O’Reilly Media.
3. Pedro Franco “ Understanding Bitcoin - Cryptography, engineering, and economics” 2016, John Wiley and sons Ltd.

OUTCOMES:

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

- Demonstrate the fundamentals of Blockchain, its historical perspective and its architecture
- Deal with the design issues and consensus in permission-less and permissioned Blockchain models
- Explain the concepts, benefits and design of blockchain frameworks such as hyperledger fabric and hyperledger composer and design a model using these.
- Discuss the impact of Blockchain in various areas
- Enlighten how the business through blockchain is secured

ITCY119	BIG DATA ANALYTICS FOR IOT	L	T	P	C
		3	0	0	3

OBJECTIVES:

To enable the students to

- To understand the evolution and significance of IoT for Big Data.
- To identify and explore tools and methods to implement Data Science.
- To explore the concepts of machine learning tools in cognitive science.
- To explore the frameworks of IoT for data science.

Prerequisite: Machine Learning, Big Data Analytics, Internet of Things.

MODULE I BIG DATA SCIENCE AND MACHINE INTELLIGENCE 09

Enabling Technologies for Big Data Computing – Interactive SMACT technologies – Mobile Devices – Internet Edge Networks – Cognitive Computing

MODULE II IOT SENSING, MOBILE AND COGNITIVE SYSTEMS 10

Sensing Technologies for Internet of Things – Introducing RFID sensor technologies – IoT frameworks with interactive environment- Sensing through smart phones – Cognitive Computing Technologies prototype systems – Cognitive Science – Cognitive science – Neuroinformatics- IoT context for cognitive services.

MODULE III SUPERVISED AND UNSUPERVISED MACHINE LEARNING ALGORITHMS 09

Taxonomy of machine Learning algorithms - Supervised Machine learning algorithms- Rule based classification - Nearest neighborhood classifier- Support vector machine- Bayesian classifier – Introduction to association analysis – Clustering methods without labels – Semi-supervised machine learning-

MODULE IV BIG DATA ANALYTICS FOR COGNITIVE LEARNING & IoT 08

IoT based case studies for Healthcare – Machine learning tools – IoT applications – IoT sensing devices - Predictive Analytics – Emotional computing services – Emotional interaction through IoT and Clouds- Performance analysis for decision support systems.

MODULE V ADAPTIVE NEURAL NETWORK STRUCTURE FOR SELF AWARE IOT 09

Introduction to Neural networks, Single Layer Neural networks – Multilayer Artificial Neural networks – Deep belief Networks – Convolutional Neural networks – Pooling in CNN – Self aware IoT - Neural Network algorthims used in IoT- Case studies.

Total : 45 Hours

TEXT BOOKS:

1. Kai Hwang, Min Chen, Big-Data Analytics for Cloud, IoT and Cognitive Computing , Wiley Publications, 2017
2. Bessis, Nik, Dobre, Ciprian, Big Data and Internet of Things: A Roadmap for Smart Environments, Springer Publications, 2014
3. Dey, N., Hassanien, A.E., Bhatt, C., Ashour, A.S., Satapathy, S.C., Internet of Things and Big Data Analytics Toward Next-Generation Intelligence, Springerlink publications, 2018.

OUTCOMES:

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

- Explore fundamentals of IoT in Big data analytics
- Understand the concepts of Machine learning and Cognitive Science.
- Building frameworks based on IoT environments.
- Explore advanced frameworks of Deeplearning for data science.