DEPARTMENT OF INFORMATION TECHNOLOGY

VISION

To produce globally competent, quality technocrats, to inculcate values of leadership and research qualities and to play a vital role in the socio – economic progress of the nation.

MISSION

M1 : To partner with the University community to understand the information technology needs of faculty, staff and students.

M2 : To develop dynamic IT professionals with globally competitive learning experience by providing high class education.

M3 : To involve graduates in understanding need based Research activities and disseminate the knowledge to develop entrepreneur skills.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1 : Engineers will practice the profession of engineering using a systems perspective and analyze, design, develop, optimize & implement engineering solutions and work productively as engineers, including supportive and leadership roles on multidisciplinary teams.

PEO2 : Continue their education in leading graduate programs in engineering & interdisciplinary areas to emerge as researchers, experts, educators & entrepreneurs and recognize the need for, and an ability to engage in continuing professional development and life-long learning.

PEO3 : Engineers, guided by the principles of sustainable development and global interconnectedness, will understand how engineering projects affect society and the environment.

PEO4 : Promote Design, Research, and implementation of products and services in the field of Engineering through Strong Communication and Entrepreneurial Skills.

PEO5 : Re-learn and innovate in ever-changing global economic and technological environments of the 21st century.

PROGRAMME OUTCOMES (POs)

After the successful completion of the M.E. (Information Technology) degree programme, the students will be able to:

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

At the time of graduation, the students will be able to :

PSO1 : Comprehend mathematical and computational methodologies to address the requirement of different domains in the field of Information Technology

PSO2 : Analyze, design and implement IT enabled solutions to meet industrial and Research needs using appropriate tools and techniques.

PSO3: Apply the knowledge of management principles and soft skills to carry out Information Technology projects with social and environmental awareness to have a successful career in industry or research environments.

Mapping Programme Educational Objectives (PEOs) with Programme Outcomes (POs)					
	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	✓				
PO2	✓				
PO3	✓			✓	✓
PO4	✓	✓			
PO5	✓	✓		✓	✓
PO6	✓	✓	✓		
PO7		✓	✓		
PO8		✓	✓		
PO9		✓	✓	✓	
PO10			✓	✓	✓
PO11			✓	✓	✓
PO12		✓		✓	✓

ANNAMALAI UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
M.E. (Two Year) Degree Programme (FULL–TIME)
Choice Based Credit System (CBCS)
COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION 2019)

SEMESTER I

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPC11	**PC**	Program Core-I - Mathematics for Computing	3	-	-	25	75	100	3
ITITPC12	**PC**	Program Core-II – Advanced Data Structures	3	-	-	25	75	100	3
ITITPE13	**PE**	Program Elective-I	3	-	-	25	75	100	3
ITITPE14	**PE**	Program Elective-II	3	-	-	25	75	100	3
ITITMC15	**MC**	Research Methodology and IPR	2	-	-	25	75	100	2
ITITCP16	**CP**	Laboratory I – Advanced Data Structures Lab	-	-	3	40	60	100	2
ITITCP17	**CP**	Laboratory II - Advanced Network Technology Lab	-	-	3	40	60	100	2
ITITAC18	**AC**	Audit Course-I English for Research Paper Writing	2	-	-	-	-	-	0
			TOTAL			**205**	**495**	**700**	**18**

SEMESTER II

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
ITITPC21	**PC**	Program Core-III – Advanced Algorithms	3	-	-	25	75	100	3
ITITPC22	**PC**	Program Core-IV – Big Data Analytics	3	-	-	25	75	100	3
ITITPE23	**PE**	Program Elective-III	3	-	-	25	75	100	3
ITITPE24	**PE**	Program Elective-IV	3	-	-	25	75	100	3
ITITOE25	**OE**	Open Elective - I	3	-	-	25	75	100	3
ITITCP26	**CP**	Laboratory III – Big Data and Hadoop Lab	-	-	3	40	60	100	2
ITITTS27	**TS**	Industrial Training and Seminar/ Mini Project	-	Tr 2	S 2	40	60	100	2
ITITAC28	**AC**	Audit Course-II	2	-	-	-	-	-	0
			TOTAL			**205**	**495**	**700**	**19**

ANNAMALAI UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
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COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION 2019)

SEMESTER III

Course Code	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
ITITPE31	**PE**	Program Elective-V	3	-	-	25	75	100	3
ITITOE32	**OE**	Open Elective - II	3	-	-	25	75	100	3
ITITPV33	**PV-I**	Thesis Phase – I & Viva-voce	-	Pr 16	S 4	40	60	100	10
			TOTAL			**90**	**210**	**300**	**16**

SEMESTER IV

Course Code	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
ITITPV41	**PV-II**	Thesis Phase-II & Viva-voce	-	Pr 24	S 6	40	60	100	15
			TOTAL			**40**	**60**	**100**	**15**

PC	**Program Core**	**CP**	Core Practical	**AC**	Audit Course
PE	**Program Elective**	**TS**	Industrial Training and Seminar	**PV**	Project work & Viva-voce
OE	**Open Elective**	**MC**	Mandatory Learning Course	**XX**	Branch code
				YY	M.E Specialization Code

LIST OF PROGRAM ELECTIVES

S. No	COURSE CODE	PROGRAM ELECTIVES
1.	ITITPESCN	Advanced Network Technology
2.	ITITPESCN	Integrated Software Engineering Methodology
3.	ITITPESCN	Soft Computing
4.	ITITPESCN	Mobile and Pervasive Computing
5.	ITITPESCN	Optimization Techniques
6.	ITITPESCN	Information Storage and Management
7.	ITITPESCN	Protocols and Architecture for Wireless Sensor Networks
8.	ITITPESCN	Semantic Web
9.	ITITPESCN	Advanced Databases
10.	ITITPESCN	Optical Networks
11.	ITITPESCN	Cluster Computing
12.	ITITPESCN	Cloud computing Technologies
13.	ITITPESCN	Green Computing
14.	ITITPESCN	Quantum Computing
15.	ITITPESCN	Cryptography and Information Security
16.	ITITPESCN	Wireless Communication Techniques
17.	ITITPESCN	Internet of Things
18.	ITITPESCN	Cross – Informatics
19.	ITITPESCN	Text Mining
20.	ITITPESCN	Machine Learning Techniques
21.	ITITPESCN	Software Reliability Engineering
22.	ITITPESCN	3G and 4G Wireless Networks
23.	ITITPESCN	Advanced Image Processing
24.	ITITPESCN	Biometric Security
25.	ITITPESCN	Distributed Systems Security
26.	ITITPESCN	Wireless Security
27.	ITITPESCN	Audio Processing
28.	ITITPESCN	Sensing Techniques and Sensors
29.	ITITPESCN	Advanced Wireless and Mobile Networks
30.	ITITPESCN	Data Warehousing and Mining
31.	ITITPESCN	Advanced Machine Learning
32.	ITITPESCN	Nature Inspired Metaheuristic optimization algorithms
33.	ITITPESCN	Digital Image and Video Processing
34.	ITITPESCN	Ethical Hacking and Network Defense
35.	ITITPESCN	Digital Forensics
36.	ITITPESCN	Computer Vision

LIST OF OPEN ELECTIVES

S.No	COURSE CODE	OPEN ELECTIVES
1.	ITITOESCN	Web Integrated Technologies
2.	ITITOESCN	Decision Management Systems
3.	ITITOESCN	Cyber Forensics
4.	ITITOESCN	Data Science and Analytics
5.	ITITOESCN	Pattern Recognition
6.	ITITOESCN	Human and Computer Interaction
7.	ITITOESCN	Mobile Application Development
8.	ITITOESCN	Information retrieval
9.	ITITOESCN	Middleware for Communications

AUDIT COURSES – I & II

S. No	COURSE CODE	AUDIT COURSES
1.	ITITACSCN	English for Research Paper Writing
2.	ITITACSCN	Disaster Management
3.	ITITACSCN	Sanskrit for Technical Knowledge
4.	ITITACSCN	Value Education
5.	ITITACSCN	Constitution of India
6.	ITITACSCN	Pedagogy Studies
7.	ITITACSCN	Stress Management by Yoga
8.	ITITACSCN	Personality Development through Life Enlightenment Skills

ANNAMALAI UNIVERSITY
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M.E. (Three Year) Degree Programme (PART–TIME)
Choice Based Credit System (CBCS)
COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION 2019)

SEMESTER I

Course Code	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**	**Equivalent Course code in M.E. Full Time**
PITITPC11	**PC**	Program Core-I - Mathematics for Computing	3	-	-	25	75	100	3	ITITPC11
PITITPC12	**PC**	Program Core-II – Advanced Data Structures	3	-	-	25	75	100	3	ITITPC12
PITITMC13	**MC**	Research Methodology and IPR	2	-	-	25	75	100	2	ITITMC15
PITITCP14	**CP**	Laboratory I – Advanced Data Structures Lab	-	-	3	40	60	100	2	ITITCP16
					Total	**115**	**285**	**400**	**10**	

SEMESTER II

Course Code	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**	**Equivalent Course code in M.E. Full Time**
PITITPC21	**PC**	Program Core-III – Advanced Algorithms	3	-	-	25	75	100	3	ITITPC21
PITITPC22	**PC**	Program Core-IV – Big Data Analytics	3	-	-	25	75	100	3	ITITPC22
PITITOE23	**OE**	Open Elective – I	2	-	-	25	75	100	3	ITITOE25
PITITCP24	**CP**	Laboratory II - Big Data and Hadoop Lab	-	-	3	40	60	100	2	ITITCP26
					Total	**115**	**285**	**400**	**11**	

SEMESTER III

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPE31	**PE**	Program Elective-I	3	-	-	25	75	100	3	ITITPE13
PITITPE32	**PE**	Program Elective-II	3	-	-	25	75	100	3	ITITPE14
PITITCP33	**CP**	Laboratory III – Advanced Network Technolgy Lab	-	-	3	40	60	100	2	ITITCP17
					Total	**90**	**210**	**300**	**8**	

SEMESTER IV

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPE41	**PE**	Program Elective-III	3	-	-	25	75	100	3	ITITPE23
PITITPE42	**PE**	Program Elective-IV	3	-	-	25	75	100	3	ITITPE24
PITITTS43	**TS**	Industrial Training and Seminar / Mini Project		Tr 2	S 2	40	60	100	2	ITITTS27
					Total	**90**	**210**	**300**	**8**	

SEMESTER V

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPE51	**PE**	Program Elective - V	3	-	-	25	75	100	3	ITITPE31
PITITOE52	**OE**	Open Elective - II	3	-	-	25	75	100	3	ITITOE32
PITITPV53	**PV-I**	Thesis Phase – I & Viva-voce		Pr 16	S 4	40	60	100	10	ITITPV33
					Total	**90**	**210**	**300**	**16**	

SEMESTER VI

Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	Equivalent Course code in M.E. Full Time
PITITPV61	**PV-II**	Thesis Phase – II & Viva-voce		Pr 24	S 6	40	60	100	15	ITITPV41
					Total	**40**	**60**	**100**	**15**	

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19.	ITITPESCN	Text Mining
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22.	ITITPESCN	3G and 4G Wireless Networks
23.	ITITPESCN	Advanced Image Processing
24.	ITITPESCN	Biometric Security
25.	ITITPESCN	Distributed Systems Security
26.	ITITPESCN	Wireless Security
27.	ITITPESCN	Audio Processing
28.	ITITPESCN	Sensing Techniques and Sensors
29.	ITITPESCN	Advanced Wireless and Mobile Networks
30.	ITITPESCN	Data Warehousing and Mining
31.	ITITPESCN	Advanced Machine Learning
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33.	ITITPESCN	Digital Image and Video Processing
34.	ITITPESCN	Ethical Hacking and Network Defense
35.	ITITPESCN	Digital Forensics
36.	ITITPESCN	Computer Vision

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3.	ITITACSCN	Sanskrit for Technical Knowledge
4.	ITITACSCN	Value Education
5.	ITITACSCN	Constitution of India
6.	ITITACSCN	Pedagogy Studies
7.	ITITACSCN	Stress Management by Yoga
8.	ITITACSCN	Personality Development through Life Enlightenment Skills

ITITPC11	MATHEMATICS FOR COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the mathematical fundamentals for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems and Machine learning.
- To develop many modern techniques in information technology like machine learning, programming language design and concurrency.
- To study various sampling and classification problems.

Probability mass, density and cumulative distribution functions, parametric families of distributions, expected value, variance, conditional expectation, applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov Chains.

Random samples, sampling distributions of estimators, methods of moments and Maximum Likelihood.

Statistical Inference, Introduction to multivariate statistical models: Regression and Classification Problems, Principal Component Analysis, The problem of overfitting model assessment.

Graph Theory: Isomorphism, Planar graphs, graph colouring, Hamilton Circuits, and Euler Cycles, Permutations and combinations with and without repetition, specialized techniques to solve combinatorial enumeration problems.

Computer Science and Engineering Applications: Data mining, network protocols, analysis of web traffic, computer security, software engineering, computer architecture, operating systems, distributed systems, bioinformatics, machine learning. Recent trends in various distribution functions in the mathematical field of computer science for varying fields like bioinformatics, soft computing and computer vision.

REFERENCES:

1. John Vince, “Foundation Mathematics for Computer Science: A Visual Approach”, Springer, 2015.
2. Kishore S. Trivedi, “Probability and Statistics with Reliability, Queuing, and Computer Science Applications”, Wiley, 2001.
3. M. Mitzenmacher and E. Upfal, “Probability and Computing: Randomized Algorithms and Probabilistic Analysis”, Cambridge University Press, 2005.
4. Alan Tucker, “Applied Combinatorics”, Wiley, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. To understand the basic notions of discrete and continuous probability

2. To understand the methods of statistical inference and the role that sampling distributions play in those methods.
3. To acquire the basic knowledge on graph theory, and analyze various graph theory based algorithms.
4. To be able to perform correct and meaningful statistical analyses of simple to moderate complexity.
5. To develop real time applications in the field of information technology.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	2	-	-	-	-	-	-	3	-	-
CO2	3	3	3	-	2	2	-	-	-	-	-	-	3	2	1
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	3	1
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	3	-	-	-	-	-	-	3	3	3

		L	T	P	C
ITITPC12	**ADVANCED DATA STRUCTURES**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- The student should be able to choose appropriate data structures, understand the ADT/libraries, and use it to design algorithms for a specific problem.
- Students should be able to understand the necessary mathematical abstraction to solve problems.
- To familiarize students with advanced paradigms and data structure used to solve algorithmic problems.
- Student should be able to come up with analysis of efficiency and proofs of correctness.

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries.

Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Skip Lists: Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Trees: Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees

Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer- Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.

Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.

Recent Trends in Hashing, Trees, and various computational geometry methods for efficiently solving the new evolving problem

REFERENCES:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. R.F. Gisberg, B.A. Forouzan, “Data Structures”, Second Edition, Thomson India, 2005.
4. A.V. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson Education, First Edition Reprint, 2003.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the implementation of symbol table using hashing techniques.
2. Develop and analyze algorithms for red-black trees, B-trees and Splay trees.
3. Develop algorithms for text processing applications.
4. Identify suitable data structures and develop algorithms for computational geometry problems.
5. Solve problems by implementing learned algorithm design techniques and data structures.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	1	1	-	2	1	-	1	3	1	-
CO2	3	3	2	2	-	-	-	-	2	1	-	1	3	3	-
CO3	3	3	2	3	1	-	-	1	1	-	-	1	2	3	-
CO4	3	3	2	3	1	-	-	-	1	-	-	1	3	2	-
CO5	3	3	2	2	1	-	-	-	1	-	-	1	2	3	-

ITITMC15	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To gain a sound knowledge of scientific research for undertaking a valid study
- To explore the techniques of defining a research problem and investigate the various research designs, highlighting their main characteristics
- To understand the ethical issues of writing technical papers
- To provide an insight on intellectual property
- To address new and international developments in IPR.

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Effective literature studies approaches, analysis-Plagiarism, Research ethics Effective technical writing, how to write report, Paper-Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.Patent information and data bases.Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc.Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”, Juta Academic, 1996
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”, Juta Academic, 2004
3. Ranjit Kumar, “Research Methodology: A Step by Step Guide for beginners”,Sage Publications Ltd, 2014
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall , “Industrial Design”, McGraw Hill, 1992.
6. Niebel , “Product Design”, McGraw Hill, 1974.

7. Asimov , “Introduction to Design”, Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016.
9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand research problem formulation.
2. Analyze research related information and Follow research ethics
3. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
4. Understand that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
5. Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	3	-	-	3	2	-	-	-	-	-	2	-
CO2	3	2	2	3	-	3	3	2	-	3	-	-	3	2	-
CO3	3	3	2	3	2	-	2	-	-	3	-	-	3	2	-
CO4	3	3	-	3	-	2	3	-	-	3	-	-	3	2	3
CO5	3	2	3	2	2	3	2	1	-	2	-	-	3	1	3

ITITCP16	**ADVANCED DATA STRUCTURES LAB**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- To acquire the knowledge of using advanced tree structures.
- To learn the usage of heap structures.
- To understand the usage of graph structures and spanning trees.
- To learn the working of various string matching algorithms.

LIST OF EXERCISES

1. Implementation of a Binary Search Tree.

2. Red-Black Tree Implementation.
3. Heap Implementation.
4. Binomial Heaps.
5. Graph Traversals.
6. Spanning Tree Implementation.
7. Shortest Path Algorithms.
8. String Matching Algorithms.
9. Approximation Algorithms.
10. Implementation of Singly Linked List (addition, deletion, insertion in all positions)
11. Implementation of Doubly Linked List (addition, deletion, insertion in all positions)
12. Implementation of Quick sort, Merge sort, Shell sort
13. Implementation of Depth First Search
14. Applications of Linked List, Stack and Queue in real world

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design and implement basic and advanced data structures extensively.
2. Design algorithms using graph structures.
3. Design and develop efficient algorithms with minimum complexity using design techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	-	1	1	-	1	-	-	1	3	1	-
CO2	3	3	2	2	1	-	-	-	1	1	-	1	3	2	-
CO3	3	3	2	3	1	-	-	1	1	1	-	1	2	2	-

ITITCP17	**ADVANCED NETWORK TECHNOLOGY LAB**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- To study various network simulators, client-server communication using TCP and UDP, FTP and domain name space.
- To study about peer- to- peer communication and socket programming.
- To study about client server communication and multicast programming.

LIST OF EXERCISES

1. Study of network simulators like NS2, Glomosim, OPNET.
2. Implementation of client-server communication using TCP.
3. Implementation of UDP client server communication using bind, Sendto, Recvfrom system call.
4. Implementation of simple FTP client.
5. Implementation of Domain Name Space.
6. Simulation of BGP/OSPF routing protocol.
7. Simulation of ARP/RARP.
8. Implementation of Peer – to – peer communication using UDP
9. Implementation of Socket program for UDP Echo Client and Echo Server
10. Implementation of file transfer from Client to Server
11. Implementation of Client Server Application for chat
12. Client Server Communication using Object Stream
13. Client Server Communication using Byte Stream.
14. Implementation of Online test for a single client
15. Java Multicast Programming

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Implement client server communication, FTP client.
2. Implement peer to peer communication and socket programming.
3. Implement client server communication and multi cast programming.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	3	-	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	3	-	-	-	-	-	-	-	-	-	-	3

		L	T	P	C
ITITAC18	**ENGLISH FOR RESEARCH PAPER WRITING**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in eachsection
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission syllabus.

Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

Key skills that are needed when writing a Title, key skills are needed when writing an Abstract, key skills that are needed when writing an Introduction, skills needed when writing a Review of the Literature,

Skills that are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills that are needed when writing the conclusion.

Useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

REFERENCES:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on GoogleBooks) Model Curriculum of Engineering & Technology PG Courses [Volume-I] [41]
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press.
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM Highman's book.
4. Adrian Wall work , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Plan and prepare paragraphs without ambiguity and vagueness.
2. Check plagiarism and paraphrasing.
3. Review the literatures and write a good discussion on any topic.
4. Utilize the knowledge obtained to write a good research paper.

ITITPC21	ADVANCED ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- Introduce students to the advanced methods of designing and analyzing algorithms.
- The student should be able to choose appropriate algorithms and use it for a specific problem.

- To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
- Students should be able to understand different classes of problems concerning their computation difficulties.
- To introduce the students to recent developments in the area of algorithmic design.

Sorting: Review of various sorting algorithms, topological sorting

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST.

Graph Matching: Algorithm to compute maximum matching. Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem.

Discrete Fourier Transform (DFT): In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage-Strassen Integer Multiplication algorithm

Linear Programming: Geometry of the feasibility region and Simplex algorithm

NP-completeness: Examples, proof of NP-hardness and NP-completeness.

One or more of the following topics based on time and interest

Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.

REFERENCES:

1. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms"
2. Aho, Hopcroft, Ullman, “The Design and Analysis of Computer Algorithms"
3. Kleinberg and Tardos, "Algorithm Design"

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Analyze the complexity/performance of different algorithms.
2. Determine the appropriate data structure for solving a particular set of problems.
3. Categorize the different problems in various classes according to their complexity.
4. Students should have an insight of recent activities in the field of the advanced data structure.
5. Gain a good understanding of applying advanced algorithms to real-world problems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-	2	2	-
CO3	-	2	3	3	-	-	-	-	-	-	-	-	2	1	1
CO4	-	3	-	-	-	-	-	-	-	-	-	3	3	-	-
CO5	3	3	3	3	3	3	-	-	-	-	-	-	2	3	3

		L	T	P	C
ITITPC22	**BIG DATA ANALYTICS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn basic tools of R for statistical data analysis and data visualization.
- To understand and implement machine learning techniques applicable for feature extraction and modeling.
- To comprehend the characteristics and importance of big data from different a perspective.
- To analyze the architecture of Hadoop and create a Hadoop cluster.
- To develop MapReduce programs for parallel processing using Hadoop.

Introduction of Data Science – Basic Data Analytics using R – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

Advanced analytical theory and methods - Overview of Clustering – K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R – Classification – Decision Trees – Overview of a Decision Tree – Decision Tree

Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

Big data from different perspectives - Big data from business Perspective: Introduction of big data – Characteristics of big data – Data in the warehouse and data in Hadoop – Importance of Big data – Big data Use cases: Patterns for Big data deployment. Big data from Technology Perspective: History of Hadoop – Components of Hadoop – Application Development in Hadoop – Getting your data in Hadoop – other Hadoop Component.

Hadoop distributed file system architecture - HDFS Architecture – HDFS Concepts – Blocks – NameNode – Secondary NameNode – DataNode – HDFS Federation – Basic File System Operations – Data Flow – Anatomy of File Read – Anatomy of File Write.

Processing your data with MapReduce – Getting to know MapReduce – MapReduce Execution Pipeline – Runtime Coordination and Task Management – MapReduce Application – Hadoop Word Count Implementation.

REFERENCES:

1. David Dietrich, Barry Heller and Beibei Yang, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley, ISBN 13:9788126556533, 2015.
2. Paul Zikopoulos, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, “Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data”, The McGraw-Hill Companies, ISBN : 978-0-07-179054-3, 2012.
3. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly, ISBN: 9789352130672, 2015.
4. Biris Lublinsky, Kevin T. Smith and Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN 13:9788126551071, 2015.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Use R programming language to develop data analytics based applications.
2. Apply various machine learning techniques to process data and convert hypotheses and data into actionable predictions.
3. Identify the need for big data analytics for a domain and apply big data analytics for a given problem.
4. Understand the components of the Hadoop framework and create a Hadoop cluster.
5. Develop Map Reduce modules on Hadoop framework for distributed

processing of big data.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO3	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3

ITITCP26	**BIG DATA AND HADOOP LAB**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

COURSE OBJECTIVES:

- To implement machine learning algorithms for feature extraction and modeling using WEKA tool,
- To set up single and multi node Hadoop clusters.
- To implement MapReduce programs for distributed processing using Hadoop.
- To develop solutions for real world big data problems.

LIST OF EXERCISES

Cycle I – Data Mining Using Weka

1. Identifying Rules and important Attributes.
2. Executing Classification Algorithms.
3. Deletion of Attribute, Cross Validation and Visualizing.
4. Perform Test Case Scenario.
5. Use Pruning and Reduced Error Pruning.
6. Compare different Classification Algorithms.
7. Clustering Algorithm.
8. Association Rule Mining.

Cycle II – Python Programming

1. Perform Fibonacci Sequence.
2. Calculate Area for Square, Rectangle and Circle.
3. Run a Test of Knowledge.
4. Finding most frequent words in a text read from a file.

Cycle III – Hadoop

1. Set up a pseudo-distributed, single-node Hadoop cluster backed by the Hadoop Distributed File System, running on Ubuntu Linux. After successful installation on one node, configuration of a multi-node Hadoop cluster (one master and multiple slaves).

2. Map Reduce application for word counting on Hadoop cluster.
3. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
4. K-means clustering using map reduce.
5. Page Rank Computation.
6. Mahout machine learning library to facilitate the knowledge build up in big data analysis.
7. Application of Recommendation Systems using Hadoop/mahout libraries.

COURSE OUTCOMES:

Upon of completion of this course, the students will be able to

1. Implement classification and clustering algorithms based systems for real world data using WEKA tools.
2. Set up single and multi-node Hadoop Clusters. Apply Map Reduce algorithms for various applications.
3. Implement various machine learning algorithms using Mahout library. Design new algorithms that use Map Reduce to apply on unstructured and structured data.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO3	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3

		L	TR	S	C
ITITTS27	**INDUSTRIAL TRAINING AND SEMINAR / MINI PROJECT**	**0**	**2**	**2**	**2**

COURSE OBJECTIVES:

- To train the students in the field work related the Information Technology and to have a practical knowledge in carrying out Information Technology field related works.
- To train and develop skills in solving problems during execution of certain works related to Information Technology.
- To work on a technical topic related to Information Technology and acquire the ability of written and oral presentation
- To acquire the ability of writing technical papers for Conferences and Journals.

Each student should individually undergo a training program in reputed industries in the field of Information Technology during the summer vacation (at the end of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training he/she had, within ten days from the commencement of the third semester for Full-time / fifth semester for part-time. The student will be evaluated, by a team of staff members nominated by Head of the department, through a viva-voce examination.

Further, each student will work for two periods per week guided by student counsellor. He/she will be asked to present a seminar of not less than fifteen minutes and not more than thirty minutes on any technical topic of student's choice related to Information Technology and to engage in discussion with audience and will defend the presentation. A brief copy of the presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation and the report and also on the interaction shown during the seminar.

COURSE OUTCOMES:

Upon of completion of this course, the students will be able to

1. Face the challenges in the field with confidence.
2. Benefit by the training with managing the situation that arises during the execution of works related to Information Technology.
3. Get the training to face the audience and to interact with the audience with confidence.
4. Tackle any problem during group discussion in the corporate interviews.
5. Gain practical knowledge in carrying out Information Technology related works.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	2	2	-	1	-	1	-	2	2	2
CO2	2	-	-	2	-	2	-	-	1	-	-	-	2		2
CO3	-	-	-	2	-	2	-	-	1	2	1	-	2	1	1
CO4	-	-	-	-	-	1	-	-	2	2	1	-	-	1	1
CO5	2	2	2	-	-	1	1	-	-	-	-	-	1	-	1

ITITPV33	THESIS PHASE – I & VIVA - VOCE	L	PR	S	C
		0	16	4	10

COURSE OBJECTIVES:

- To train the students in the current thrust area in Information Technology and to have practical knowledge in handling the technical scenario.
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
- To carry out thesis work Phase – I which consists of problem statement, literature review, thesis overview and scheme of implementation.
- To train the students in preparing technical reports, and to face reviews and viva voce examinations.

METHOD OF EVALUATION:

The student undergoes literature survey and identifies the topic of thesis and finalizes in consultation with Guide/Supervisor and prepares a comprehensive thesis report after completing the work to the satisfaction of the supervisor.

The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

A thesis report is required at the end of the semester.

The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES:

Upon of completion of this course, the students will be able to

1. Review quality of Literature survey and Novelty in the problem
2. Assess clarity of Problem definition and Feasibility of problem solution
3. Validate the relevance to the specialization
4. Acquire Knowledge on the clarity of objective and scope
5. Improve the quality of Written and Oral Presentation

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	3	1	-	-	-	1	1	2	-
CO2	3	2	3	2	2	-	-	2	-	-	-	-	1	-	-
CO3	2	1	-	1	1	-	-	-	-	1	1	2	2	1	-
CO4	3	-	-	-	-	-	-	-	-	1	3	-	-	-	2
CO5	2	-	-	-	-	-	-	-	-	2	-	-	-	-	1

ITITPV41	THESIS PHASE – II & VIVA - VOCE	L	PR	S	C
		0	24	6	15

COURSE OBJECTIVES:

- To develop skills on the research topic and to implement appropriate methods to handle the issue.
- To attempt the solution to the problem by analytical/ simulation/ experimental methods and validate with proper justification.
- To encourage the students in preparing conference and journal articles based on their research work, presenting them in conferences, and publishing their work through reputed journals.

METHOD OF EVALUATION:

The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

A thesis report is required at the end of the semester.

The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES:

Upon of completion of this course, the students will be able to

1. Identify the real world power system problems
2. Analyze, design and implement solution methodologies
3. Apply modern engineering tools for solution
4. Write technical reports following professional ethics
5. Develop effective communication skills to present and defend their research work to a panel of experts.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	2	-	-
CO3	2	-	-	1	3	-	-	-	-	-	-	-	1	-	1
CO4	3	-	-	-	-	-	-	2	-	3	-	-	-	3	-
CO5	2	-	-	-	-	-	-	-	-	3	-	-	-	-	3

PROGRAM ELECTIVES

ITITPESCN	ADVANCED NETWORK TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the fundamentals of communication networks.
- To describe the traffic characteristics descriptors.
- To illustrate integrated services architecture.
- To familiarize with different network devices.
- To expose to software defined networks.

Communication Networks – Network Elements – Switched Networks and Shared Media Networks – Probabilistic Model and Deterministic Model – Datagrams and Virtual Circuits – Multiplexing – Switching – Error and Flow Control – Congestion Control – Layered Architecture – Network Externalities – Service Integration.

Traffic Characteristics and Descriptors – Quality of Service and Metrics – Best Effort model and Guaranteed Service Model – Limitations of IP networks – Scheduling and Dropping Policies for BE and GS models – Traffic Shaping Algorithms – End to End Solutions – Laissez Faire Approach – Possible improvements in TCP – Significance of UDP in Inelastic Traffic.

Integrated Services Architecture – Components and Services – Differentiated Services Networks – Per Hop Behavior – Admission Control – MPLS Networks – Principles and Mechanisms – Label Stacking – RSVP – RTP/RTCP.

Network Devices – Switch – Router – Hardware Components- Software – Configuration – Routing Concepts- Static Routing – Dynamics Routing–Switching and Routing Devices – Router Structure – Configuring EGP – RIP – OSPF – IS-IS – Hub – Bridges – Routers – Link Virtualization – Multicast Architecture.

History – Data Plane Support for SDN – Software Routers – Programmable Hardware –Control Plane Support for SDN – Modern SDN Stack – Programming Languages – Applications – Data Centre Networking –Software Defined Radio – Campus Networks.

REFERENCES:

1. Mahbub Hassan and Raj Jain, ‘High Performance TCP/IP Networking’, Pearson Education/PHI, 2009.
2. Larry L Peterson and Bruce S Davie, ‘Computer Networks: A Systems Approach’, Fifth Edition, Morgan Kaufman Publishers, 2012.
3. Jean Warland and Pravin Vareya, ‘High Performance Networks’, Morgan Kauffman Publishers, 2002
4. James Macfarlane ,” Network Routing Basics: Understanding IP Routing in Cisco Systems”, Wiley Edition I, 2006.
5. William Stallings, High Speed Networks: Performance and Quality of Service, Pearson Education, 2008.

6. Mani Subramaniam, Network Management: Principles and Practices, Pearson Education, 2010.

COURSE OUTCOMES:

Upon completion of course the students will be able to

1. Understand the concepts of communication networks, multiplexing, switching, error control, congestion control and layered architecture.
2. Analyze traffic characteristics, quality of service metrics.
3. Acquire knowledge about integrated services architecture.
4. Construct network systems using various network devices such as switches, routers and other hardware components.
5. Design networking system such as campus networks.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	-	3	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	3	-	-	-	-	-	-	2	-	-	-	3
CO5	3	3	3	3	-	-	-	-	-	-	2	-	-	-	3

		L	T	P	C
ITITPESCN	**INTEGRATED SOFTWARE ENGINEERING METHODOLOGY**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To provide information about wider engineering issues that form the background to developing complex, evolving (software-intensive) systems.
- To plan a software engineering process to account for quality issues and non – functional requirements.
- To employ a selection of concepts and techniques to complete a small-scale analysis and design in mini projects.
- To impart knowledge to translate requirement specifications into a design, and then realize that design practically, all using an appropriate software engineering methodology.
- To provide basic knowledge about software project management.

Introduction – S/W Engineering Paradigm — Life Cycle Models –Introduction to System Concepts - Managing Complex Software — Properties – Object Oriented

Systems Development – Object Basics – Systems Development Life Cycle Rumbaugh Methodology - Booch Methodology - Jacobson Methodology – Unified Process.

Systems Engineering - Analysis Concepts - Functional and Non-Functional – Software Document – Requirement Engineering Process – Feasibility Studies – Software Prototyping – Prototyping in the Software Process – Data – Functional and Behavioral Models – Structured Analysis and Data Dictionary. Unified Approach – Unified Modeling Language – Static behavior diagrams – Dynamic Behavior diagrams – Object Constraint Language.

Design Process And Concepts – Modular Design – Design Heuristic – Architectural Design – Data Design – User Interface Design – Requirements to Design – Design Axioms – Logical Architecture - Designing Objects with Responsibilities – Object Design – Designing for Visibility. Patterns – Analysis and Design patterns – GoF Patterns - Mapping designs to code –Test Driven development and refactoring – UML Tools and UML as blueprint.

Taxonomy of Software Testing – Types of S/W Test – Black Box Testing – Testing Boundary Conditions – Structural Testing – Test Coverage Criteria Based on Data Flow Mechanisms – Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing and Debugging – Software Implementation Techniques.

Measures and Measurements – ZIPF‟s Law – Software Cost Estimation – Function Point Models – COCOMO Model – Delphi Method – Scheduling – Earned Value Analysis – Error Tracking – Software Configuration Management – Program Evolution Dynamics – Software Maintenance – Project Planning – Project Scheduling– Risk Management – CASE Tools.

REFERENCES:

1. Ian Sommerville, “Software engineering”, Ninth Edition, Pearson Education Asia, 2010.
2. Roger S. Pressman, “Software Engineering – A practitioner’s Approach”, Seventh Edition, Tata McGraw-Hill International Edition, 2009.
3. Ivar Jacobson, “Object Oriented Software Engineering”, Pearson Education, 1992.
4. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Third Edition, Narosa publications, 2011.
5. Craig Larman. “Applying UML and Patterns – An introduction to Object-Oriented Analysis and Design and Iterative Development”, 3rd edition, Pearson Education, 2005.
6. Fowler, Martin, “UML Distilled”, 3rd Edition, Pearson Education, 2004.
7. Michael Blaha and James Rumbaugh, “Object-oriented modeling and design with UML”, Prentice-Hall of India, 2005.
8. Grady Booch, “Object Oriented Analysis and Design”, 2nd edition, Pearson Education, 2000.

9. Ali Bahrami, “Object Oriented Systems Development”, Tata McGrawHill, 1999.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the advantages of various Software Development Lifecycle Models
2. Compare different process models.
3. Learn UML models and tools.
4. Apply design patterns on various applications.
5. Understand the concepts and techniques to complete a small-scale analysis and design in mini projects.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	1	-	1	1	1	2	1	1	1	3	1	1
CO2	3	3	2	1	-	1	-	1	2	1	-	1	3	3	1
CO3	3	3	2	2	1	1	-	1	1	-	2	2	2	3	-
CO4	3	3	3	3	1	1	-	1	1	-	2	3	3	2	-
CO5	3	3	2	2	1	1	-	1	1	-	2	2	2	3	-

ITITPESCN	**SOFT COMPUTING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
- To implement soft computing based solutions for real-world problems.
- To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
- To provide student an hand-on experience on MATLAB to implement various strategies.

INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS: Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

FUZZY LOGIC: Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

NEURAL NETWORKS: Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

GENETIC ALGORITHMS: Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

Matlab/Python Lib: Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm.

Implementation of recently proposed soft computing techniques.

REFERENCES

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice Hall of India, 2003.
2. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall, 1995.
3. MATLAB Toolkit Manual.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. Apply fuzzy logic and neural networks to and solve various engineering problems with uncertainty
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.
5. Implement soft computing based solutions for real-world problems uisng Matlab and Python.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	-	3	3	-	-	-	1	-	-	3	-	-
CO2	-	3	3	3	3	-	-	1	1	-	-	-	3	-	-
CO3	3	3	3	-	-	2	-	-	1	2	2	2	3	-	-
CO4	3	3	3	-	-	1	-	-	-	-	2	2	-	3	-
CO5	-	-	-	-	-	-	-	-	3	3	3	3	-	-	3

ITITPESCN	MOBILE AND PERVASIVE COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basics of Mobile Computing and Personal Computing.
- To learn the role of cellular networks in Mobile and Pervasive Computing.
- To expose to the concept of sensor and mesh networks.
- To expose to the context aware and wearable computing.
- To learn to develop applications in mobile and pervasive computing environment.

Introduction – Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices.

3G AND 4G Cellular Networks – Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.9G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP.

Sensor And Mesh Networks – Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks.

Context Aware Computing & Wearable Computing – Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications.

Application Development – 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.

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, 2nd ed, Tata McGraw Hill, 2010.
2. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
3. Pei Zheng and Lionel M Li, “Smart Phone & Next Generation Mobile Computing”, Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein, “Fundamentals of Mobile and Pervasive Computing”, TMH, 2005.
5. Jochen Burthardt et al, “Pervasive Computing: Technology and Architecture of Mobile Internet Applications”, Pearson Education, 2003.
6. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufmann Publishers, 2004.
7. Uwe Hansmaan et al, “Principles of Mobile Computing”, Springer, 2003.
8. Reto Meier, “Professional Android 2 Application Development”, Wrox Wiley, 2010.
9. Mohammad s. Obaidat et al, “Pervasive Computing and Networking”, John Wiley & Sons, 2011.
10. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and Interactions”, Wiley, 2009.
11. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwiebert “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design a basic architecture for a pervasive computing environment.
2. Design and allocate the resources on the 3G-4G wireless networks.
3. Analyze the role of sensors in Wireless networks.
4. Work out the routing in mesh network.
5. Deploy the location and context information for application development.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	1	1	2	2	1	1	2	1	-
CO2	3	1	2	-	-	-	-	1	2	2	-	1	2	1	-
CO3	3	3	2	-	1	-	-	1	1	1	-	2	1	1	-
CO4	3	1	3	-	1	-	-	-	1	1	1	1	1	2	-
CO5	3	1	1	-	1	-	-	-	1	1	2	1	1	1	-

ITITPESCN	OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide insight to the mathematical formulation of real world problems.
- To optimize these mathematical problems using nature based algorithms and the solution is useful specially for NP-Hard problems.
- To introduce recent trends and applications in optimization.

Engineering application of Optimization, Formulation of design problems as mathematical programming problems.

General Structure of Optimization Algorithms, Constraints, The Feasible Region.

Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.

Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.

Real life Problems and their mathematical formulation as standard programming problems.

Recent trends: Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications..

REFERENCES

1. Laurence A. Wolsey, “Integer programming”, Wiley, 1998.
2. Andreas Antoniou, “Practical Optimization Algorithms and Engineering Applications”.
3. Edwin K., P. Chong & Stanislaw h. Zak, “An Introduction to Optimization”.
4. Dimitris Bertsimas; Robert Weismantel, “Optimization over integers, Dynamic Ideas”, 2005, ISBN 978-0-9759146-2-5.
5. John K. Karlof, “Integer programming: theory and practice”, CRC Press, 2006.
6. H. Paul Williams, “Logic and Integer Programming”, Springer, 2009.
7. Michael Jünger, Thomas M. Liebling, Denis Naddef, George Nemhauser, William R. Pulleyblank, Gerhard Reinelt, Giovanni Rinaldi, Laurence A. Wolsey, “50 Years of Integer Programming 1958-2008: From the Early Years to the State-of-the- Art”, Springer, 2009.
8. Der-San Chen, Robert G. Batson, Yu Dang, “Applied Integer Programming: Modeling and Solution”, John Wiley and Sons, 2010.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Formulate optimization problems

2. Understand and apply the concept of optimality criteria for various types of optimization problems
3. Solve various constrained and unconstrained problems in Single variable as well as multivariable
4. Apply the mathematical optimization methods in real life situations
5. Apply various intelligent algorithms in real world problems

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	3	-	-	-	-	-	-	3	-	-
CO2	-	2	2	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	1	-	-	-	-	-	-	3	-
CO4	-	3	3	3	3	-	1	-	-	-	1	1	-	-	2
CO5	-	-	-	-	3	-	-	-	3	1	3	3	-	-	3

ITITPESCN	**INFORMATION STORAGE AND MANAGEMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To identify the components of managing the data center and understand logical and Physical components of a storage infrastructure.
- To evaluate storage architectures including storage subsystems SAN, NAS, IPSAN, CAS.
- To understand the business continuity, backup and recovery methods.

Introduction to Information Storage Management - Data Center Environment– Database Management System (DBMS) - Host - Connectivity –Storage-Disk Drive Components- Intelligent Storage System -Components of an Intelligent Storage System- Storage Provisioning- Types of Intelligent Storage Systems.

Fibre Channel: Overview - SAN and Its Evolution -Components of FC SAN -FC Connectivity-FC Architecture- IPSAN-FCOE-FCIP-Network-Attached Storage-General-Purpose Servers versus NAS Devices - Benefits of NAS- File Systems and Network File Sharing-Components of NAS - NAS I/O Operation -NAS Implementations -NAS File-Sharing Protocols-Object-Based Storage Devices Content - Addressed Storage -CAS Use Cases.

Business Continuity -Information Availability -BC Terminology-BC Planning Life Cycle - Failure Analysis -Business Impact Analysis-Backup and Archive -Backup Purpose Backup Considerations -Backup Granularity - Recovery

Considerations -Backup Methods -Backup Architecture - Backup and Restore Operations.

Cloud Enabling Technologies -Characteristics of Cloud Computing -Benefits of Cloud Computing -Cloud Service Models-Cloud Deployment models - Cloud Computing Infrastructure-Cloud Challenges.

Information Security Framework -Storage Security Domains-Security Implementations in Storage Networking - Monitoring the Storage Infrastructure - Storage Infrastructure Management Activities -Storage Infrastructure Management Challenges.

REFERENCES:

1. EMC Corporation, Information Storage and Management”, Wiley India, Edition, 2011.
2. Robert Spalding, Storage Networks: The Complete Reference”, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, Edition, 2001.
4. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited, 2002.

COURSE OUTCOMES:

Upon completion of this course the students may be able to

1. Explain the components and functions of Information Storage Systems.
2. Design the storage system for the given scenario
3. Investigate the common issues in Storage Infrastructure.
4. Outline the need and importance of Information Availability and Business Continuity
5. Analyze the security of Information Storage Systems

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	-	-	-	-	-	-	-	-	1	2	1	-
CO2	3	2	1	-	-	-	-	1	-	-	-	1	2	1	-
CO3	3	2	1	-	-	-	-	1	1	-	-	1	1	1	-
CO4	2	1	1	-	-	-	-	-	1	-	1	1	1	1	-
CO5	2	2	1	2	-	-	-	-	1	1	-	1	1	1	-

ITITPESCN	PROTOCOLS AND ARCHITECTURE FOR WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the issues in the design of ad hoc and wireless sensor networks.
- To understand the working of protocols in different layers of ad hoc and sensor networks.
- To expose the students to different aspects in ad hoc and sensor networks.
- To understand various standards and applications in ad hoc and sensor networks.

Introduction and Overview of Wireless Sensor Networks, Background of Sensor Network Technology, Application of Sensor Networks, Challenges for Wireless Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

Architectures, Single-node Architecture, Hardware Components & Design Constraints, Operating Systems and Execution Environments, Introduction to TinyOS and nesC, Network Architecture, Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design Principles for WSNs, Service Interfaces of WSNs, Gateway Concepts.

Deployment and Configuration, Localization and Positioning, Coverage and Connectivity, Single-hop and Multi-hop Localization, Self-Configuring Localization Systems, Sensor Management Network Protocols: Issues in Designing MAC Protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC Protocol, IEEE 802.15.4 Standard and Zig Bee, Dissemination Protocol for Large Sensor Network.

Routing Protocols and Data Manipulation, Issues in Designing Routing Protocols, Classification of Routing Protocols, Energy-Efficient Routing, Unicast, Broadcast and Multicast, Geographic Routing. Data Centric and Content based Routing, Storage and Retrieval in Network, Compression Technologies for WSN, Data Aggregation Technique.

Sensor Network Platforms and Tools, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level Software Platforms, Node-level Simulators, State-centric Programming.

REFERENCES:

1. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach”, Elsevier, 2007.
3. Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, “Wireless Sensor Network”, Springer 1st Ed. 2004 (ISBN: 978-4020-7883-5).

4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
5. N. P. Mahalik, “Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications” Springer – Verlag Berlin Heidelberg, 2007.
6. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

COURSE OUTCOMES:

Upon completion of this course students should be able to

1. Identify different issues in wireless ad hoc and sensor networks.
2. Analyze the protocols developed for ad hoc and sensor networks.
3. Identify and discuss the standards and applications of ad hoc and sensor networks.
4. Identify about various routing protocols.
5. Analyze about sensor nodes.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	2	-	2	2	2	-	-
CO2	2	3	3	2	3	3	-	3	-	2	-	3	-	2	2
CO3	2	3	-	2	2	2	3	2	3	3	-	2	3	-	-
CO4	3	2	3	3	-	-	-	-	2	-	2	2	2	-	-
CO5	3	2	3	3	-	-	-	-	2	-	2	2	2	-	-

		L	T	P	C
ITITPESCN	**SEMANTIC WEB**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the importance of semantic web.
- To study the various semantic knowledge representation strategies.
- To understand the concepts of Ontology.
- To develop the Ontology related tools.

The Future of the Internet: Introduction - The Syntactic Web – The Semantic Web - How the Semantic Web Will Work. Ontology in Computer Science - Defining the Term Ontology - Differences among Taxonomies – The sauri – and Ontologies, Classifying Ontologies - Web Ontologies, Web Ontology Description Languages - Ontology - Categories - and Intelligence.

Knowledge Representation in Description Logic – Introduction - An Informal Example - The Family of Attributive Languages - Inference Problem. RDF and RDF Schema – Introduction - XML Essentials – RDF – RDF Schema - A Summary of the RDF/RDF Schema Vocabulary. OWL – Introduction - Requirements for Web Ontology Description Languages – Header Information – Versioning – and Annotation Properties – Properties – Classes – Individuals – Data types - A Summary of the OWL Vocabulary.

Rule Languages – Introduction - Usage Scenarios for Rule Languages – Datalog - RuleML – SWRL - TRIPLE. Semantic Web Services – Introduction - Web Service Essentials – OWL - S Service Ontology - An OWL - S Example.

Methods for Ontology Development – Introduction - Uschold and King Ontology Development Method - Toronto Virtual Enterprise Method – Methontology- KACTUS Project Ontology Development Method – Lexicon – Based Ontology Development Method - Simplified Methods Ontology Sources – Introduction – Metadata – Upper Ontologies Other Ontologic of Interest – Ontology Libraries.

Semantic Web Software Tools – Introduction - Metadata and Ontology Editors- Reasoners - Other tools. Software Agents – Introduction - Agent Forms - Agent Architecture - Agents in the Semantic web Context.Semantic Desktop – Introduction - Semantic Desktop Metadata - Semantic Desktop Ontologies - Semantic Desktop Architecture - Semantic Desktop Related Applications. Ontology Application in Art – Introduction – Ontologies for the Description of Works of Art - Metadata Schemas for The Description of Works of Art - Semantic Annotation of Art Images.

REFERENCES:

1. Karin K. Breitman, Marco Antonio Casanova and Walter Truszowski, “Semantic Web Concepts: Technologies and Applications”, Springer Science & Business Media, 2007.
2. Heiner Stuckenschmidt, Frank van Harmelen,” Information Sharing on the Semanting Web”, Springer Science & Business Media, 2005.
3. Grigoris Antoniou, Frank Van, “Semantic Web Primer”, MIT press, 2004.
4. Rudi Studer, Stephan Grimm, Andrees Abeker, “Semantic Web Services: Concepts, Technologies and Applications”, Springer, 2007.
5. John Davis, Dieter Fensal, Frank Van Harmelen,J. Wiley , “Towards the Semantic Web: Ontology Driven Knowledge Management”, John Wiley & Sons, 2003.

COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Compare conventional web with semantic web.
2. Analyze and design semantic knowledge representation modes.
3. Construct ontology using different tools.
4. Use semantic web services with web applications.

5. Determine the various Semantic Web Software Tools.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	2	1	-	-	-	-	-	-	-	-	-	2
CO4	3	-	2	1	-	-	-	-	-	-	-	-	1	-	-
CO5	-	2	-	3	3	1	-	1	-	-	-	-	-	-	2

ITITPESCN	ADVANCED DATABASES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the modeling and design of databases.
- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented and Intelligent databases.
- To understand the usage of active database.
- To study the different types of advanced databases.

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- 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.

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle – Case Studies.

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications Design –Principles for Active Rules- Temporal Databases: Overview of

Temporal Databases-TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Implementation of Rules and Recursion- Recursive Queries in SQL - Spatial Databases - Spatial Data Types- Spatial Relationships- Spatial Data Structures – Spatial Access Methods- Spatial DB Implementation.

Mobile Databases: Location and Handoff Management – Effect of Mobility on Data Management – Location Dependent Data Distribution – Mobile Transaction Models –Concurrency Control – Transaction Commit Protocols- Multimedia Databases- Information Retrieval- Data Warehousing- Data Mining- Text Mining.

XML Databases: XML-Related Technologies-XML Schema- XML Query Languages- Storing XML in Databases-XML and SQL- Native XML Databases- Web Databases- Geographic Information Systems- Biological Data Management- Cloud Based Databases: Data Storage Systems on the Cloud- Cloud Storage Architectures-Cloud Data Models- Query Languages- Introduction to Big Data-Storage-Analysis.

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2008.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Fourth Edition, Pearson Education, 2008.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
4. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, “Advanced Database Systems”, Morgan Kaufmann publishers, 2006.
6. Vijay Kumar, “Mobile Database Systems”, John Wiley & Sons, 2006.
7. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Develop in-depth understanding of relational databases and skills to optimize database performance in practice.
2. Understand and critique on each type of databases.
3. Design faster algorithms in solving practical database problems.
4. Gathering knowledge of database distribution, warehouse and mining.
5. To gathering knowledge of working with different advanced of data model.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	2	1	1	-	1	-	1	3	-	-
CO2	3	3	2	2	1	-	-	1	1	-	-	1	2	-	-
CO3	3	2	2	2	1	1	-	1	1	1	-	1	3	2	-
CO4	3	2	2	1	-	-	1	1	-	1	-	1	3	-	-
CO5	3	2	2	1	1	1	1	1	-	-	-	1	2	-	-

		L	T	P	C
ITITPESCN	**OPTICAL NETWORKS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue.
- To expose the student to the advances in packet switching in the optical domain, the associated challenges and the possible solution approaches.
- To introduce to high capacity networks.
- To study the wavelength routing network.
- To study network design and management.

Introduction – Light wave generation systems, system components, optical fibers, SI, GI, fibers, modes, Dispersion in fibers, limitations due to dispersion, Fiber loss, nonlinear effects. Dispersion shifted and Dispersion flattened fibers. Optical transmitters, receivers and amplifiers. First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers, filters, switches, and wavelength converters.

Optical Network Architectures – Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks- Topologies for Broadcast Networks, Media-Access Control Protocols, Testbeds for Broadcast & Select WDM; Wavelength Routing Architecture. Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.

Broadcast And Select Networks – Topologies, Single-hop, Multihop, and Shufflenet multihop networks, Media-Access control protocols, Test beds.

WAVELENGTH-ROUTING NETWORKS: The Optical layer, Node Designs, Optical layer cost tradeoff, Routing and Wavelength Assignment, Virtual Topology design, Wavelength Routing Test beds, Architectural variations.

Packet Switching and Access Networks – Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch based networks; Access Networks- Network Architecture overview, Future Access Networks, Optical Access Network Architectures; and OTDM networks.

High Capacity Networks, Network Design and Management – SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test bed. Transmission system Engineering-system model, Power penalty-transmitter, receiver, Optical amplifiers, crosstalk, dispersion, wavelength stabilization; overall design consideration; Control and Management-Network manage functions, Configuration management, Performance management, Fault management. Optical safety, Service interface.

REFERENCES:

1. Rajiv Ramaswami and Kumar Sivarajan, “Optical Networks: A practical perspective”, Morgan Kaufmann, 2nd edition, 2001.
2. Vivek Alwayn, “Optical Network Design and Implementation”, Pearson Education, 2004.
3. Keiser G., “Optical fiber communication systems”, McGraw - Hill, 2000.
4. Hussein T. Mouftab and Pin-Han Ho, “Optical Networks: Architecture and Survivability”, Kluwer Academic Publishers, 2002.
5. Biswanath Mukherjee, “Optical Communication Networks”, McGraw Hill, 1997.
6. Ramaswami, Rajiv, Kumar Sivarajan, and Galen Sasaki, “Optical networks: a practical perspective”, Morgan Kaufmann, 2009.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn the importance of the backbone infrastructure for our present and future communication needs.
2. Familiarize with the architectures and the protocol stack in use.
3. Understand concepts of broadcast and network.
4. Understand the differences in the design of routing, switching and the resource allocation methods.
5. Knowledge of network high capacity, design, and management.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	-	-	-	2	2	1	2	1	1	1	3	-	-
CO2	3	2	2	2	-	-	-	1	2	-	1	1	-	2	-
CO3	3	2	2	2	1	1	-	1	-	-	1	1	3	-	-
CO4	3	1	2	1	1	1	1	1	-	-	1	1	3	-	-
CO5	3	1	2	1	-	-	-	1	-	-	1	1	2	1	-

		L	T	P	C
ITITPESCN	**CLUSTER COMPUTING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To be able to understand the Cluster installation and configuration.
- Understand the importance of protocols and standards in computing.
- To understand the Parallel programming models & paradigms.
- To familiarize with Job management system and cluster scheduling process.

Overview of cluster computing: Elements of cluster, requirements-classes of cluster- Hardware system structure- Node software- Node hardware: Mother board, Memory, Basic Input Output Stream-Peripheral Component Interconnect (PCI) bus, Node assembly.

Network Hardware: Interconnecting Technologies, Pitfalls in cluster networks- Network software: sockets, Distributed File System, Remote command execution- Setting up clusters: Cluster configuration, Installation of a node, Basic system administration-Security- NPACI Rocks (Rocks cluster Distribution) - OSCAR Toolkits-Load balancing.

Parallel programming with Message Passing Interface (MPI): MPI compilation and running process, Implementation of MPI for clusters-Dynamic process management-Fault tolerance-RMA- Performance measurement - Parallel Virtual Machine (PVM): Overview, Setup, console details Extended PVM.

Goal of workload management software- management activities-Distributed job scheduler – condor: features, architecture – Installation – Configuration – Administration tools.

Scheduling Parallel jobs on cluster-High performance cluster scheduler: Maui: overview, Installation-Configuration – Overview of Portable Batch System:

Architecture, Features and PVFS: Parallel virtual File System – Mapping and scheduling on Heterogeneous system.

REFERENCES:

1. Thomas Sterling, “Beowulf Cluster Computing with Linux”, MIT Press, Second Edition, 2003.
2. Rajkumar Buyya, “High Performance Cluster Computing: Architectures and Systems”, Vol. 1, Prentice Hall PTR, 2007.
3. Rajkumar Buyya, “High Performance Cluster Computing: Programming and Applications”, Vol 2, Prentice Hall PTR, NJ, USA, 1999.
4. Plaza, Antonio J., and Chein-I. Chang, eds. High performance computing in remote sensing. CRC Press, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Learn the structure,elements and components of Cluster Computing.
2. Know and apply the Cluster hardware configuration, Installation and administrationmethods and tools.
3. Understand the Parallel programming models & paradigms.
4. Familiarize the job management system and administration.
5. Study the cluster scheduling process and file system.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1	-	-	-	1	1	2	2	2	1	2	2	2	2
CO2	2	1	2	1	2	1	-	2	2	2	2	2	2	1	1
CO3	2	2	2	1	1	1	1	2	1	2	1	2	2	2	2
CO4	2	1	-	-	-	1	1	2	2	2	1	2	2	2	2
CO5	2	1	2	1	2	1	-	2	2	2	2	2	2	1	1

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

COURSE OBJECTIVES:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To apply trust-based security model to real-world security problems.
- An overview of the concepts, processes, and best practices needed to successfully secure information within Cloud infrastructures.

- Students will learn the basic Cloud types and delivery models and develop an understanding of the risk and compliance responsibilities and Challenges for each Cloud type and service delivery model.

Introduction to Cloud Computing: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

Cloud Computing Architecture: Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services, Delivery Model

Cloud Deployment Models: Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in theEnterprise

Security Issues in Cloud Computing: Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security

Identity and Access Management: Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management

Security Management in the Cloud: Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS

Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations

Audit and Compliance: Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud

ADVANCED TOPICS: Recent developments in hybrid cloud and cloud security

REFERENCES:

1. John Rhoton, “Cloud Computing Explained: Implementation Handbook for Enterprises”, Publication Date: November 2, 2009
2. Tim Mather, “Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)”, ISBN-10: 0596802765,O'Reilly Media, September 2009

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify security aspects of each cloud model.
2. Study the architecture, requirements and implementation of Cloud.
3. Deploy a risk-management strategy for moving to the Cloud.
4. Implement a public cloud instance using a public cloud service provider.
5. Apply trust-based security model to different layer.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	1	1	2	2	2	1	2	1	2	1
CO2	2	1	2	1	2	1	-	2	2	2	2	2	1	2	1
CO3	2	2	2	1	1	1	1	2	1	2	2	2	1	2	1
CO4	2	1	-	-	-	1	1	2	2	2	2	2	1	2	1
CO5	2	1	2	1	2	1	-	2	2	2	1	2	1	1	2

ITITPESCN	GREEN COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To acquire knowledge to adopt green computing practices.
- To understand how to minimize equipment disposal requirements.
- To introduce Socio-cultural aspects of Green IT.
- To study the virutulizing of IT systems.
- Introduce the environmental responsible business strategies.

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture –Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

Virtualizing of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

REFERENCES:

1. Bhuvan Unhelkar, "Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2011.
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.
3. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center: steps for the Journey", Shoff/IBM rebook, 2011.
4. John Lamb, "The Greening of IT", Pearson Education, 2009.
5. Jason Harris, "Green Computing and Green IT- Best Practices on regulations & industry", Lulu.com, 2008.
6. Carl speshocky, "Empowering Green Initiatives with IT", John Wiley & Sons, 2010.
7. Wu Chun Feng (editor), "Green computing: Large Scale energy efficiency", CRC Press, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Minimize negative impacts on the environment.
2. Develop skill in energy saving practices in their use of hardware.
3. Examine technology tools that can reduce paper waste and carbon footprint by user.
4. Understand Knowledge of social aspects of green IT
5. Understand the responsibility of environmental business strategeis

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	2	1	-	1	1	1	3	-	-
CO2	3	3	2	2	-	-	-	-	1	1	1	1	2	-	-
CO3	3	3	2	2	-	-	-	1	-	-	1	1	3	2	-
CO4	3	2	2	1	-	-	1	1	-	1	1	1	3	-	-
CO5	3	2	2	1	-	-	-	1	-	1	1	1	2	1	-

ITITPESCN	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- The course will provide an insight of basic of quantum physics from a computer scientist's perspective, and how it describes reality and understand the philosophical implications of quantum computing.
- To study about matrices and operator.
- To Understand the density operator.
- To study about Tensor products and Quantum measurement.
- To introduce recent trends in Quantum Computing theory.

Qubit & Quantum States: The Qubit, Vector Spaces. Linear Combination of Vectors, Uniqueness of a spanning set, basis & dimensions, inner Products, orthonormality, gram-schmidt orthogonalization, bra-ket formalism, the Cauchyschwarez and triangle Inequalities.

Matrices & Operators: Observables, The Pauli Operators, Outer Products, The Closure Relation, Representation of operators using matrices, outer products & matrix representation, matrix representation of operators in two dimensional spaces, Pauli Matrix, Hermitian unitary and normal operator, Eigen values & Eigen Vectors, Spectral Decomposition, Trace of an operator, important properties of Trace, Expectation Value of Operator, Projection Operator, Positive Operators

Commutator Algebra, Heisenberg uncertainty principle, polar decomposition & singular values, Postulates of Quantum Mechanics.

Tensor Products: Representing Composite States in Quantum Mechanics, Computing inner products, Tensor products of column vectors, operators and tensor products of Matrices.

Density Operator: Density Operator of Pure & Mix state, Key Properties, Characterizing Mixed State, Practical Trace & Reduce Density Operator, Density Operator & Bloch Vector.

Quantum Measurement Theory: Distinguishing Quantum states & Measures, Projective Measurements, Measurement on Composite systems, Generalized Measurements, Positive Operator- Valued Measures.

Recent trends in Quantum Computing Research, Quantum Computing Applications of Genetic Programming.

REFERENCES:

1. Zdzislaw Meglicki, “Quantum Computing without Magic”
2. DAVID Mc MAHON, “Quantum Computing Explained”
3. Marco Lanzagorta, Jeffrey Uhlmann, “Quantum Computer Science”

4. Phillip Kaye, Raymond Laflamme, Michele Mosca, “An Introduction to Quantum Computing”

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Knowledge of Vector spaces, Matrices, Quantum state, Density operator and Quantum Measurement theory.
2. Understand and explain the basic notions of Quantum Computing - including Quantum Bits and registers, Quantum Evolution, Quantum Circuits, Quantum Teleportation and the basic Quantum Algorithms known at the present time.
3. Identify the essential difference between the classical paradigm and the quantum paradigm of computation and appreciate why quantum computers can solve currently intractable problems.
4. Knowledge and understand density operator and measurement theory.
5. Knowledge about recent trends in quantum theory.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	-	-	-	1	-	1	1	1	3	1	-
CO2	3	3	2	2	-	-	-	1	-	-	1	1	2	-	-
CO3	3	3	2	2	-	1	-	1	-	-	1	1	3	-	-
CO4	3	-	-	-	-	-	1	1	-	-	1	1	3	1	-
CO5	3	-	-	-	-	-	-	1	-	-	-	1	2	-	-

		L	T	P	C
ITITPESCN	**CRYPTOGRAPHY AND INFORMATION SECURITY**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the mathematics behind Cryptography.
- To understand the standard algorithms used to provide confidentiality, integrity and authenticity.
- To get the knowledge of various security practices applied in the field of information technology.

Overview - Classical Crypto Systems – Substitution Ciphers –Transposition Ciphers- Stream and Block Ciphers – Introduction to Number Theory – Congruences – Chinese Remainder Theorem Modular Arithmetic-Modular Exponentiation – Fermats and Eulers Theorem - Finite Fields –GF(2n) Fields.

Symmetric Encryption Techniques – DES – AES- Public-Key Cryptography and RSA – Key Management - Diffie-Hellman Key Exchange – Elliptic Curve Cryptography – Symmetric Key Distribution – Kerberos - X.509 Authentication Service - differential cryptanalysis - linear cryptanalysis - side channel attack - lattice reduction attack - Merkle-Hellman knapsack attack - Hellman's time-memory tradeoff (TMTO) attack.

Message Authentication and Hash Functions – Description of MD Hash Family – Secure Hash Algorithms – SHA 512 - Digital Signatures and Authentication Protocols – Digital Signature Standard – Process, Services, Attacks on Digital Signature-Digital Signature Schemes.

Information Security-Statistical database security -Access Control Models - Discretionary Access Control (DAC)-Mandatory Access Control (MAC)- Role-Based Access Control (RBAC); Network and Internet Security-E-mail security-User Safety-Program Security -- Viruses, Worms-Firewalls- Intrusion Detection, Fault tolerance and recovery-Information Warfare-Security Administration.

Multilevel Security- Multilevel Security Architectures- Oracle Virtual Database System- Identification/Authentication-Database Intrusion Control- Survivable Database Systems- Distributed databases- Secure transaction processing - Security in Data warehousing- Data Mining and Security- Cloud Security- Web Databases-Semi-structured Databases XML Security-Case studies- System Security-Windows security- UNIX security and Security-Enhanced Linux (SELinux)-Web security-Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

REFERENCES:

1. Douglas R. Stinson. Cryptography Theory and Practice (2nd ed). CRC Press, 2002.
2. Alfred J. Menezes, Paul C. van Oorshot, Scott A. Vanstone. Handbook of Applied Cryptography, CRC Press, 1997.
3. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Sixth Edition, 2013.
4. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory”, Second Edition, Pearson Education, 2007.
5. Mark Stamp, “Information Security: Principles and Practice”, Wiley Inter Science, 2011.
6. OWASP top ten security vulnerabilities: http://xml.coverpages.org/OWASP-TopTen.pdf
7. Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson Education, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Predict the vulnerabilities across any computing system.
2. Apply modern cryptographic techniques for secured data transmission
3. Apply access control mechanisms to protect systems from attacks.
4. Develop firewalls and intrusion detection system
5. Develop multilevel Database security solution for any computing system.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	3	1	1	3	-	-	-	2	2	1	2	3	2	2
CO2	1	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO3	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO4	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO5	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2

ITITPESCN	**WIRELESS COMMUNICATION TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the issues involved in mobile communication system design and analysis.
- To understand the concept of frequency reuse.
- To understand the characteristics of wireless channels.

Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity –Capacity comparisons – Capacity of Frequency Selective Fading channels.

Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter symbol Interference.

Realization of Independent Fading Paths – Receiver Diversity – Selection Combing – Threshold Combing – Maximal-Ratio Combing – Equal - Gain Combing – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme– Transmit & Receive Diversity-MIMO Systems.

Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Subchannels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio-Frequency and Timing offset – Case study IEEE 802.11a.

Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service – Improving coverage & capacity in cellular systems-Cell Splitting- Sectoring-Repeaters for Range Extension-Microcell Zone Concept.

REFERENCES:

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Wiley Series in Telecommunications, Cambridge University Press, 2005.
2. Theodore.S. Rappaport, “Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, India, 2009.
3. Arogyaswami Paulraj, Rokit Nabar, Dhananjay Gore, “Introduction to Space-Time Wireless Communication”, 1st Edition, Cambridge University Press, 2008.
4. W.C.Y.Lee, “Mobile Cellular Telecommunications - Analog and Digital Systems”, 2nd Edition, Tata McGraw Hill, 2006.
5. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Acquire knowledge in different modulation schemes and its error probability in wireless system.
2. Learn the fundamental limits on the capacity of wireless channels.
3. Understand the diversity concepts.
4. Understand the characteristics of wireless networks
5. Analyze the concepts of frequency reuse

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	3	3	-	-	-	-	2	-	2	-
CO2	3	3	3	3	-	-	-	-	-	-	-	2	-	3	-
CO3	3	3	3	3	2	-	-	-	3	-	-	2	3	-	-
CO4	3	3	3	3	-	3	3	-	-	-	-	2	-	2	-
CO5	3	3	3	3	-	-	-	-	-	-	-	2	-	3	-

ITITPESCN	**INTERNET OF THINGS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the basics of Internet of Things.
- To get an idea of some of the application areas where Internet of Things can be applied.

- To understand the middleware for Internet of Things.
- To understand the concepts of Web of Things.
- To understand the IOT protocols.

Introduction to ad hoc networks- Differences between cellular and ad hoc wireless networks- Challenges and issues in ad hoc networks-Introduction to WSN-Single node architecture-Network architecture- Localization and positioning-Operating systems for WSN. The DNA of IoT - DCM: Device, Connect, and Manage, Device: Things that Talk, Connect: Via Pervasive Networks, Wired Networks, Wireless Networks Satellite IoT Manage: To Create New Business Value.

Middleware For IoT - Overview of Middleware, Communication Middleware for IoT - MTC/M2M Middleware, SCADA Middleware, RFID Middleware, WSN Middleware. Protocol Standards for IoT - IoT Protocol Standardization Efforts - M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards: A Challenging Task, Unified Identification of Objects.

Web of Things versus Internet of Things - Two Pillars of the Web - Architecture standardization for WoT - Platform Middleware for WoT - Standards for M2M, Frameworks for WSN, Standards for SCADA, Extensions on RFID Standards - Unified Multitier WoT Architecture, SOA/EAI versus SODA/MAI, OSGi: The Universal Middleware, WoT Framework Based on Data Standards - WoT Portals and Business Intelligence, Challenges of IoT Information Security.

Integrated Billing Solutions in the Internet of Things - Cost of RFID and the Internet of Things, Benefits of RFID and the Internet of Things, Cost Benefit Sharing, A Technical Framework for Integrating Billing Capabilities into the EPC global Network - Business Models for the Internet of Things - Business Models and Business Model Innovation - Value Creation in the Internet of Things - Exemplary Business Model Scenarios for the Internet of Things - Product as a Service (PaaS), Information Service Provider, End – User Involvement, Right - time Business Analysis and Decision making.

Ubiquitous IoT Applications - A Panoramic View of IoT Applications - Important Vertical Applications – Telematics and Intelligent Transport Systems, Smart Grid and Electric Vehicles, Smarter Planet and Smart Buildings - Using Internet of Things Concepts to Provide High Interoperability for Logistics Systems - Semantic Web - Ontology - Ontology and the Organizational Perspective, Ontology and the IT - System Perspective, Ontology and the Data Perspective, Ontologies in Multi-agent Systems, The Role of a Top - level Ontology.

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. Networks, Crowds, and Markets: Reasoning About a Highly-Connected World - David Easley and Jon Kleinberg, Cambridge University Press – 2010.
4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley – 2012.
5. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things – Key applications and Protocols”, Wiley, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Identify and design the new models for market strategic interaction
2. Design a middleware for IoT.
3. Compare various issues in Web of Things (WOT) and Internet of Things(IOT)
4. Develop schemes for the Various Business Models and usage of RFID
5. Develop schemes for the applications of IOT in real time scenarios

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO3	2	-	3	2	3	-	-	-	-	-	-	1	-	-	-
CO4	1	-	3	1	3	-	-	-	-	-	-	-	-	3	2
CO5	1	-	3	1	3	-	-	-	-	-	-	-	-	3	3

ITITPESCN	CROSS – INFORMATICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To gain knowledge about medical informatics and healthcare informatics.
- To understand the case study of computerized patient record.
- To study and use different tools for clinical information system.
- To apply the knowledge of Bio informatics for systems.

Introduction - Structure of Medical Informatics – Internet and Medicine - Security Issues Computer based Medical Information Retrieval, Hospital Management and Information System - Functional Capabilities of a Computerized HIS - E-Health Services - Health Informatics – Medical Informatics – Bioinformatics.

Strategic Planning - Selecting a Health Care Information System - Systems Integration and Maintenance - Systems Integration - Regulatory and Accreditation Issues - Contingency Planning and Disaster Recovery.

Introduction - History taking by Computer, Dialogue with the Computer - Components and Functionality of CPR - Development Tools – Intranet - CPR in Radiology - Application Server Provider - Clinical Information System - Computerized Prescriptions for Patients.

Automated Clinical Laboratories - Automated Methods in Hematology - Cytology and Histology - Intelligent Laboratory Information System - Computerized ECG, EEG And EMG - Computer Assisted Medical Imaging - Nuclear Medicine - Ultrasound Imaging Ultrasonography - Computed X - Ray Tomography - Radiation Therapy and Planning, Nuclear Magnetic Resonance.

Pair wise Sequence Alignment – Local Versus Global Alignment – Multiple Sequence Alignment – Computational Methods – Dot Matrix Analysis – Substitution Matrices – Dynamic Programming – Word Methods – Bayesian Methods – Multiple Sequence Alignment – Dynamic Programming – Progressive Strategies – Iterative Strategies – Tools – Nucleotide Pattern Matching – Polypeptide Pattern Matching – Utilities – Sequence Databases.

REFERENCES:

1. R.D.Lele, "Computers in Medicine Progress in Medical Informatics", Tata Mcgraw Hill Publishing Computers, 2005.
2. Mohan Bansal, "Medical informatics", Tata McGraw Hill Publishing, 2003.
3. Burke, Lillian; Well, Barbara, "Information Technology for the Health Professions", Prentice Hall, 2006.
4. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.

COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Design and develop clinical and hospital management system on their own.
2. Work with different medical imaging techniques.
3. Apply the knowledge of bio informatics for biological databases. Learn hybrid representations and its Applications.
4. Express the various methods of Automated Clinical Laboratories.
5. Develop alignments using bio informatics.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2	-	-	1	-	-	-	-	-	3	-	-
CO3	3	3	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	3	-	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	-	2	1	3	-	1	-	1	-	-	-	-	-	1	-

ITITPESCN	TEXT MINING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the basic issues and types of text mining.
- To appreciate the different aspects of text categorization and clustering.
- To understand the role played by text mining in Information retrieval and extraction.
- To appreciate the use of probabilistic models for text mining.
- To appreciate the current trends in text mining.

Overview of text mining – Definition- General Architecture– Algorithms– Core Operations – Preprocessing– Types of Problems- basics of document classification- information retrieval- clustering and organizing documents- information extraction- prediction and evaluation-Textual information to numerical vectors -Collecting documents-document standardization – tokenization – lemmatization- vector generation for prediction- sentence boundary determination -evaluation performance.

Text Categorization – Definition – Document Representation –Feature Selection - Decision Tree Classifiers - Rule-based Classifiers - Probabilistic and Naive Bayes Classifiers - Linear Classifiers- Classification of Linked and Web Data – Meta – Algorithms– Clustering –Definition- Vector Space Models - Distance-based Algorithms- Word and Phrase-based Clustering -Semi-Supervised Clustering - Transfer Learning.

Information retrieval and text mining- keyword search- nearest-neighbor methods – similarity- web based document search – matching- inverted lists- evaluation. Information extraction Architecture - Co-reference - Named Entity and Relation Extraction- Template filling and database construction – Applications. Inductive -Unsupervised Algorithms for Information Extraction. Text Summarization Techniques - Topic Representation - Influence of Context - Indicator Representations - Pattern Extraction - A priori Algorithm – FP Tree algorithm.

Probabilistic Models for Text Mining -Mixture Models - Stochastic Processes in Bayesian Nonparametric Models - Graphical Models - Relationship Between Clustering, Dimension Reduction and Topic Modeling - Latent Semantic Indexing - Probabilistic Latent Semantic Indexing -Latent Dirichlet Allocation- Interpretation and Evaluation - Probabilistic Document Clustering and Topic Models - Probabilistic Models for Information Extraction - Hidden Markov Models - Stochastic Context-Free Grammars - Maximal Entropy Modeling - Maximal Entropy Markov Models - Conditional Random Fields.

Visualization Approaches - Architectural Considerations - Visualization Techniques in Link Analysis – Example- Mining Text Streams - Text Mining in Multimedia - Text Analytics in Social Media - Opinion Mining and Sentiment Analysis - Document Sentiment Classification - Opinion Lexicon Expansion - Aspect-

Based Sentiment Analysis - Opinion Spam Detection – Text Mining Applications and Case studies.

REFERENCES:

1. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”, Springer, paperback 2010.
2. Ronen Feldman, James Sanger, “The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data”-Cambridge University press, 2006.
3. Charu C. Aggarwal, ChengXiang Zhai, “Mining Text Data”, Springer, 2012.
4. Weiss, S.M., Indurkhya, N., Zhang, T., Damerau, F, “Text Mining Predictive Methods for Analyzing Unstructured Information”, Springer 2004.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the basic concepts of text mining in Information retrieval and extraction.
2. Know the implementation of different Classification and Clustering methods.
3. Study the various extraction and representation of text mining.
4. Apply probabilistic models for text mining.
5. Learn theVisualization, Analysis and current trends in text mining.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	1	1	1	1	2	1	1	2	2	2
CO2	3	3	2	2	2	1	1	1	1	1	1	1	2	2	2
CO3	3	2	2	2	2	1	1	1	1	2	1	1	2	2	2
CO4	2	2	2	2	2	1	1	1	1	2	1	2	2	2	2
CO5	2	2	2	2	2	1	1	1	1	1	1	1	2	2	2

ITITPESCN	**MACHINE LEARNING TECHNIQUES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To acquire knowledge on how to learn patterns from data.
- To learn the basic concepts of state of the art supervised and unsupervised machine learning algorithms.

- To understand various machine learning algorithms and techniques with a focus on recent advances.
- To explore suitable algorithms for developing IoT applications.

Supervised Learning (Regression/Classification) : Basic methods: Distance-based methods - Nearest – Neighbours - Decision Trees - Nave Bayes. Linear models: Linear Regression - Logistic Regression - Generalized Linear Models - Support Vector Machines - Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs – Ranking.

Unsupervised Learning : Clustering: K-means - Dimensionality Reduction: PCA and kernel PCA - Matrix Factorization and Matrix Completion - Generative Models (mixture models and latent factor models)

Evaluating Machine Learning algorithms and Model Selection - Introduction to Statistical Learning Theory - Ensemble Methods (Boosting, Bagging, Random Forests)

Sparse Modeling and Estimation - Modeling Sequence/Time-Series Data - Deep Learning and Feature Representation Learning.

Scalable Machine Learning (Online and Distributed Learning) - A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning - Inference in Graphical Models - Introduction to Bayesian Learning and Inference.

Recent trends in various learning techniques of machine learning - Classification methods for IOT applications - Various models for IOT applications.

REFERENCES:

1. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012
2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning, Springer 2009 (freely available online)
3. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.

COURSE OUTCOMES:

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

1. Understand a wide variety of supervised learning algorithms, and design and implement machine learning solutions to classification problems.
2. Be familiar with various unsupervised learning algorithms, and design and implement machine learning solutions to clustering problems.
3. Acquire knowledge of advanced learning concepts such as ensembling, sparse modeling, and deep learning.

4. Understand scalable machine learning algorithms, semi supervised and reinforcement learning.
5. Develop various IoT applications with suitable machine learning algorithms.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3

		L	T	P	C
ITITPESCN	**SOFTWARE RELIABILITY ENGINEERING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand and apply Reliability Mathematics to hardware and software systems.
- To understand evolution of software reliability growth models.
- To understand and apply Non-homogeneous Poisson Software Reliability Growth Models.

Review of Reliability Mathematics–Random Experiment-Probability Distributions Binomial-Poisson-Exponential-Weibul and Generalized Exponential Distributions Reliability Block Diagram-System Reliability-Repairable and Non-Repairable systems Maintainability and Availability-MTBF-MTTF-MDT-MTTR-Designing for higher reliability-Redundancy-k out of n systems.

Basic Concepts – Failure and Faults-Introduction to Software Reliability Growth Models (SRGMs)-General Model Characteristic-Historical Development of modelsModel Classification scheme-white box and black box models-models for application during operational phase and testing phase-Markovian models-Jelinski-Moranda model-Goel-Okumoto imperfect debugging model.

Stochastic process-Counting Process-NHPP-Execution Time-Testing time and Calendar Time modeling-Musa models-Basic Execution time-Musa-Okumoto Logarithmic Poisson Execution time models-NHPP models-Goel-Okumoto-Yamada delayed S-shaped model-Log power model-Imperfect debugging models-Kapur-Garg model.

Flexible models-Goel Generalized NHPP-S-G GENHPP- SG We NHPP models Quality metrics producing models- S-G-K (2007) model and S-G-K (2012) model Failure Data-Parameter estimation-MLE and Least squares techniques-Use of tools Comparison Criteria-Goodness of fit - Predictive Validity of Models-short term and long term.

Bayesian models-Littlewood-Verall model-Discrete Models-Efforts based models Release Time determination-criteria-cost-failure intensity-reliability.

REFERENCES:

1. John D. Musa, Anthony Iannino, Kazuhira Okumoto, “Software Reliability – Measurement, Prediction, Application, Series in Software Engineering and Technology”, McGraw Hill, 1987.
2. John D. Musa, “Software Reliability Engineering”, Tata McGraw Hill, 1999.
3. Patric D. T.O Connor, “Practical Reliability Engineering”, 4th Edition, John Wesley & sons, 2003.
4. M.Xie, “Software Reliability Modelling”, World Scientific, Singapore, 1991.

COURSE OUTCOMES:

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

1. Understand the need for flexible models.
2. Understand the quality metrics producing models.
3. Understand Determination of Software Release Time.
4. Illustrate the techniques of modern reliability engineering tools
5. Understand the concepts of reliability and maintainability

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	2	3	3	3	-	-	-	-	-	-	-	-	1	2	-
CO3	-	-	-	-	-	-	2	-	-	-	2	2	-	-	3
CO4	2	1	2	1	3	1	-	-	-	-	-	-	2	2	-
CO5	-	-	-	3	-	-	2	-	-	-	-	-	-	-	3

ITITPESCN	**3G AND 4G WIRELESS NETWORKS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn various generations of wireless and cellular networks.
- To study about fundamentals of 3G Services, its protocols and applications.

- To study about evolution of 4G Networks, its architecture and applications.

Introduction: History of Mobile Cellular Systems - First Generation - Second Generation - Generation 2.5 - Overview of 3G & 4G. 3GPP and 3GPP2 standards.

Evolution from GSM, 3G Services and Applications - UMTS network structure - Core network - UMTS Radio access - HSPA – HSUPA- HSDPA- CDMA 1X – WCDMA.

LTE: Introduction, Radio interface architecture - Physical layer, Access procedures - SystemArchitecture Evolution (SAE) - Communication protocols – Interfaces- LTE Advanced.

Introduction to WiMax Networks– IEEE 802.16 – Frame Format – Protocols - OFDM – MIMO - IEEE 802.20 – Applications.

Introduction and Evolution - Applications of DLNA and NFC – DLNA Architecture and Protocol stack - Smart phone and NFC – Mobile Commerce and NFC – NFC tags –Security Issues – Femtocells from the network operators and user‟s point of view.

REFERENCES:

1. Juha Korhonen, “Introduction to 3G Mobile Communication”, Artech House, 2003.
2. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming , “3G Evolution HSPA and LTE for Mobile Broadband”, Academic Press, 2008.
3. Flavio Muratore, “UMTS Mobile Communication for the Future”, John Wiley & Sons, 2001.
4. Harri Holma and Antti Toskala, “HSDPA/HSUPA for UMTS”, Johan Wiley & Sons, 2006.
5. Martin Sauter, “3G & 4G & Beyond: Bringing Networks, Devices and the Web together”, second edition, Wiley, 2013.

COURSE OUTCOMES:

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

1. Understand Wi MAX networks, protocol stack and standards.
2. Understand the emerging trends of smart phones.
3. Analyze latest standards like LTE
4. Gain the concepts of Wimax
5. Analyze latest standards like DLNA, NFC and femtocells.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	-	2	3	-	-	-	-	2	-	2	2
CO2	3	2	2	3	-	2	-	2	-	-	-	2	-	2	2
CO3	3	3	2	3	2	-	-	-	3	-	-	2	2	-	-
CO4	3	2	3	2	2	-	-	-	-	-	-	-	2	-	-
CO5	2	2	2	-	3	-	-	-	-	-	-	-	-	2	-

		L	T	P	C
ITITPESCN	**ADVANCED IMAGE PROCESSING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To understand the basic concepts and algorithms of digital processing.
- To familiarize the student with the image processing environments like MATLAB and its equivalent Biometric Image processing environments.
- To expose the students to a broad range of Biometric image processing techniques and issues and their applications, and to provide the student with practical experiences using them.

Digital Image representation - Fundamental steps in Image Processing - Elements of Digital Image Processing Systems - Sampling and Quantization - Basic relationships between pixels - Imaging Geometry - Transformation Technology - The Fourier Transform, The Hadamard Transform, The Discrete Cosine Transform. Image Enhancement: The Spatial Domain Methods, The Frequency Domain Methods - Image Segmentation: Pixel Classification by Thresholding, Histogram Techniques, Smoothing and Thresholding - Gradient Based Segmentation: Gradient Image, Boundary Tracking, Laplacian Edge Detection.

Fingerprint Patterns, Fingerprint Features, Fingerprint Image, width between two ridges -Fingerprint Image Processing - Minutiae Determination - Fingerprint Matching: Fingerprint Classification, Matching policies.

Detection and Location of Faces: Statistics-Based method, Knowledge-Based method - Feature Extraction and Face Recognition: Gray value Based method, Geometry Feature Based method, Neural Networks method.

Iris System Architecture, Definitions and Notations - Iris Recognition: Iris location, Doubly Dimensionless Projection, Iris code, Comparison - Coordinate System: Head Tilting Problem, Basic Eye Model, Searching Algorithm - Texture Energy Feature.

Introduction to Multibiometric - Information Fusion in Biometrics - Issues in Designing a Multibiometric System - Sources of Multiple Evidence - Levels of Fusion in Biometrics - Sensor level, Feature level, Rank level, Decision level fusion - Score level Fusion.

REFERENCES

1. David D. Zhang, “Automated Biometrics: Technologies and Systems”, Kluwer Academic Publishers, New Delhi, 2000.
2. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, “Digital Image Processing”, Pearson Education, New Delhi, 2009.
3. Arun A. Ross, Karthik Nandakumar, A.K.Jain, “Handbook of Multibiometrics”, Springer, New Delhi, 2006.
4. Pushpa Dhamala, “Multibiometric systems”, MS thesis, Institute for telematikk, 2012.
5. Anil K Jain, Patrick Flynn, Arun A Ross, “Handbook of Biometrics”, Springer, 2008.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Know the basic components of digital image processing
2. Design an application that incorporates different concepts of Biometric Image processing
3. Apply and explore new techniques in the areas of Biometric image enhancement, restoration, segmentation, compression, wavelet processing and image morphology
4. Explore the possibility of Appling Biometric image processing concepts in various domains
5. Apply the concepts in recognition of eye image

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	1	-	-	2	-	-	-	3	-	-
CO2	3	3	3	3	3	-	-	-	3	-	-	-	-	3	-
CO3	3	3	-	3	-	-	1	2	3	1	-	-	-	3	-
CO4	-	-	-	-	-	-	-	-	-	-	1	2	2	-	-
CO5	-	-	-	-	3	-	-	-	3	-	3	3	-	-	3

		L	T	P	C
ITITPESCN	**BIOMETRIC SECURITY**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To provide scientific foundations needed for the design, implementation, and evaluation of large scale biometric identification systems.
- To study physiological Biometric technologies.
- To study behavioural biometric technologies and multi Biometrics.

- To learn the technological uplifts with biometrics compared to traditional security mechanisms.
- Enhanced study in identification systems.

Biometrics- Introduction- benefits of biometrics over traditional authentication systems -benefits of biometrics in identification systems-selecting a biometric for a system –Applications - Key biometric terms and processes - biometric matching methods -Accuracy in biometric systems.

Physiological Biometric Technologies: Fingerprints - Technical description – characteristics - Competing technologies - strengths – weaknesses – deployment - Facial scan - Technical description - characteristics - weaknesses-deployment - Iris scan - Technical description – characteristics - strengths – weaknesses – deployment - Retina vascular pattern - Technical description – characteristics - strengths – weaknesses –deployment - Hand scan - Technical description-characteristics - strengths – weaknesses deployment – DNA biometrics.

Behavioral Biometric Technologies: Handprint Biometrics - DNA Biometrics - signature and handwriting technology - Technical description – classification - keyboard / keystroke dynamics - Voice – data acquisition - feature extraction - characteristics - strengths – weaknesses- deployment.

Multi biometrics: Multi biometrics and multi factor biometrics - two-factor authentication with passwords - tickets and tokens – executive decision - implementation Plan.

Case studies on Physiological, Behavioral and multifactor biometrics in identification systems.

REFERENCES:

1. Samir Nanavathi, Michel Thieme, and Raj Nanavathi, “Biometrics -Identity verification in a network”, Wiley Eastern, 2002.
2. John Chirillo and Scott Blaul,” Implementing Biometric Security”, Wiley Eastern Publications, 2005.
3. John Berger,” Biometrics for Network Security”, Prentice Hall, 2004.
4. John D. Woodward, Jr. Nicholas M. Orlans Peter T. Higgins, “Biometrics”, dreamtech, 2003.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Design biometric identification systems.
2. Implement biometric identification systems.
3. Evaluate large scale biometric identification systems.
4. Understand various biometric security issues
5. Demonstrate knowledge of the basic principles underlying biometric systems

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	-	-	-	3	-	-	-	3	-	-
CO2	3	3	3	3	3	-	-	-	1	1	1	-	3	3	-
CO3	3	3	3	3	-	1	-	-	-	-	3	-	2	2	-
CO4	-	1	-	3	-	1	2	-	-	-	1	-	2	1	-
CO5	2	1	3	1	-	1	1	1	1	-	1	1	-	1	-

ITITPESCN	**DISTRIBUTED SYSTEMS SECURITY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To explore the design and implementation of distributed systems.
- To describe fundamental concepts in IT security.
- To learn the principles used in distributed system security.
- To provide solutions in modern distributed system security.
- To analyze distributed system with respect to desired properties.

Introduction – Distributed Systems, Distributed Systems Security. Security in Engineering: Secure Development Lifecycle Processes - A Typical Security Engineering Process - Security Engineering Guidelines and Resources. Common Security Issues and Technologies: Security Issues, Common Security Techniques.

Host-level Threats and Vulnerabilities: Transient code Vulnerabilities - Resident Code Vulnerabilities - Malware: Trojan Horse – Spyware - Worms/Viruses – Eavesdropping - Job Faults. Infrastructure-Level Threats and Vulnerabilities: Network-Level Threats and Vulnerabilities - Grid Computing Threats and Vulnerabilities – Storage Threats and Vulnerabilities – Overview of Infrastructure Threats and Vulnerabilities.

Application-Layer Vulnerabilities - Injection Vulnerabilities - Cross-Site Scripting (XSS) - Improper Session Management - Improper Error Handling - Improper Use of Cryptography - Insecure Configuration Issues - Denial of Service - Canonical Representation Flaws - Overflow Issues. Service-Level Threats and Vulnerabilities: SOA and Role of Standards - Service-Level Security Requirements - Service-Level Threats and Vulnerabilities - Service-Level Attacks - Services Threat Profile.

Sandboxing – Virtualization - Resource Management - Proof-Carrying Code - Memory Firewall – Antimalware. Infrastructure-Level Solutions: Network-Level Solutions - Grid-Level Solutions - Storage-Level Solutions. Application-Level Solutions: Application-Level Security Solutions.

Services Security Policy - SOA Security Standards Stack – Standards in Dept - Deployment Architectures for SOA Security - Managing Service-Level Threats - Compliance in Financial Services - SOX Compliance - SOX Security Solutions - Multilevel Policy-Driven Solution Architecture - Case Study: Grid - The Financial Application - Security Requirements Analysis. Future Directions - Cloud Computing Security – Security Appliances - Usercentric Identity Management - Identity-Based Encryption (IBE) - Virtualization in Host Security.

REFERENCES:

1. Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli, Niranjan Varadarajan, Srinivas Padmanabhuni and Srikanth Sundarrajan, “Distributed Systems Security: Issues, Processes and Solutions”, Wiley Ltd. Publications, 2009.
2. Yang Xiao and Yi Pan, “Security in Distributed and Networking Systems”, World Scientific Publishing Company, 2007.
3. Rachid Guerraoui and Franck Petit, “Stabilization, Safety, and Security of Distributed Systems”, Springer, 2010.
4. Andrew S. Tanenbaum, and Maarten Van Steen, Distributed systems: principles and paradigms. Prentice-Hall, 2007.
5. Oldooz Karimi, "Security model for service-oriented architecture." arXiv preprint arXiv:1108.1314, 2011.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the computer system security
2. Understand the Security Appliances and Virtualization
3. Understand the Services Security Policy
4. Understand the importance of security in distributed systems
5. Understand the different distributed computing security

.Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	3	-	2	2	-	-	-	-	2	2	-	-
CO2	3	3	-	2	-	-	1	-	-	-	-	2	-	2	-
CO3	-	1	-	3	-	-	-	-	-	1	-	3	-	-	-
CO4	-	-	-	-	-	-	3	-	-	-	-	-	-	2	-
CO5	-	-	-	-	-	1	3	-	2	3	3	3	-	2	2

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<tr><td rowspan="2"><b>ITITPESCN</b></td><td rowspan="2"><b>WIRELESS SECURITY</b></td><td><b>L</b></td><td><b>T</b></td><td><b>P</b></td><td><b>C</b></td></tr>
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COURSE OBJECTIVES:

- To gain and understand the complete knowledge of threats within wireless environments.
- To recognize typical vulnerabilities and safeguards for wireless communication to include; Cellular and Personal Communications Services (PCS) network security, secure wireless encrypted e-mail solution, Wireless handheld device security, PAN and LAN security.
- To implement a CASE study on Basic specifications and Authentication services.

Introduction to Wireless technologies - Wireless data networks-Personal Area Networks -Transmission Media – WLAN standards - Securing WLANS - Countermeasures - WEP (Wired Equivalence Protocol).

Kinds of security breaches - Eavesdropping - Communication Jamming - RF interference - Covert wireless channels - DOS attack – Spoofing - Theft of services - Traffic Analysis - Cryptographic threats - Wireless Security Standards.

Wireless Device security issues - CDPD security (Cellular Digital Packet Data)- GPRS security (General Packet Radio Service) - GSM (Global System for Mobile Communication) security – IP security.

Secure Socket Layer - Wireless Transport Layer Security - WAP Security Architecture - WAP Gateway.

Basic specifications – Piconets – Bluetooth security architecture – Scatternets – Security at the baseband layer and link layer – Frequency hopping – Security manager – Authentication – Encryption – Threats to Bluetooth security.

REFERENCES:

1. Nichols and Lekka, “Wireless Security-Models, Threats and Solutions”, Tata McGraw – Hill, New Delhi, 2006.
2. Merritt Maxim and David Pollino, “Wireless Security”, Osborne/McGraw Hill, New Delhi, 2005.
3. William Stallings, “Cryptography and Network Security - Principles and practices, Prentice Hall, New Delhi, 2006.
4. Randall, K. Nichols, and Panos C. Lekkas. "Wireless security: models, threats, and solutions." MacGraw-Hill, New York (2002).

COURSE OUTCOMES:

At the end of this course, the students will be able to

1. To evaluate the complete knowledge of threats within wireless environments.
2. To understand the Wireless Device security issues.
3. To demonstrate the basic specifications, Bluetooth security.
4. To become familiar with Layer Security.
5. To make a Case study on Basic specifications and Authentication services.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	3	-	2	-	-	1	-	-	-	-	3	-
CO2	3	1	-	2	-	1	1	-	-	-	-	-	-	2	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	2	-	-
CO4	-	2	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	3	2	-	3	-	1	-	1	-	-	-	-	-	1	-

ITITPESCN	**AUDIO PROCESSING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the basic characteristics of speech and mechanism of speech production model.
- To study the basic concepts of speech analysis and synthesis systems.
- To apply linear predictive analysis techniques for speech analysis and synthesis.
- To explore various speech coding techniques.
- To develop speech and speaker recognition systems.

Principal Characteristics of Speech: Linguistic information - Speech and Hearing - Speech production mechanism - Acoustic characteristic of speech - Statistical Characteristics of speech - Speech production models - Linear separable equivalent circuit model - Vocal Tract and Vocal Cord Model.

Speech Analysis and Synthesis Systems: Digitization – Sampling - Quantization and coding - Spectral Analysis - Spectral structure of speech - Autocorrelation - Short Time Fourier transform - Window function - Sound Spectrogram - Mel frequency

Cepstral Coefficients - Filter bank and Zero Crossing Analysis – Analysis–by-Synthesis - Pitch Extraction.

Linear Predictive Coding Analysis: Principle of LPC analysis - Maximum likelihood spectral estimation - Source parameter estimation from residual signals - LPC Encoder and Decoder - PARCOR analysis and Synthesis - Line Spectral Pairs - LSP analysis and Synthesis.

Speech Coding: Reversible coding - Irreversible coding - Information rate - Distortion theory. Coding in time domain: PCM – ADPCM - Adaptive Predictive coding. Coding in Frequency domain: Sub band coding - Adaptive transform coding - Vector Quantization - Code Excited Linear Predictive Coding (CELP).

Speech Recognition: Principles of speech recognition - Speech period detection - Spectral distance measure - Structure of word recognition system - Dynamic Time Warping (DTW) - Theory and implementation of Hidden Markov Model (HMM).

Speaker recognition: Human and Computer speaker recognition principles - Text dependent and Text Independent speaker recognition systems. Applications of speech Processing.

REFERENCES:

1. Sadaoki Furui, “Digital Speech Processing, Synthesis and Recognition” 2nd Edition, Taylor & Francis, 2000.
2. Rabiner and Schafer, “Digital Processing of Speech Signals”, Pearson Education, 1979.

COURSE OUTCOMES:

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

1. Understand different characteristics of speech and speech production models.
2. Interpret various speech analysis and synthesis systems.
3. Analyze speech signals using linear predictive analysis, and apply that knowledge for developing analysis and synthesis systems.
4. Understand speech coding techniques in time and frequency domain.
5. Develop speech recognition and speaker recognition systems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	2	2	2	1	1	-	-	-	-	-	-	3	2
CO3	3	3	2	2	2	1	1	-	-	-	-	-	-	3	2
CO4	3	3	2	2	2	1	1	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	2	2	-	-	-	-	-	-	3	3

ITITPESCN	SENSING TECHNIQUES AND SENSORS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the sensor characteristics and the fundamental principles of sensing.
- To understand the sensor interface electronics.
- To study selected motion-related sensors.
- To study light and radiation detectors.
- To study selected temperature sensors and chemical sensors.

Data Acquisition – sensor characteristics – electric charges, fields, potentials – capacitance – magnetism – inductance – resistance – piezoelectric – pyroelectric – Hall effect – thermoelectric effects – sound waves – heat transfer – light – dynamic models of sensors.

Radiometry – Photometry – mirrors – lenses – fiber optics – concentrators – Interface circuits – amplifiers – light-to-voltage – excitation circuits – ADC – Digitization – Capacitance-to-voltage – bridge circuits – data transmission – noise in sensors and circuits – calibration – low power sensors.

Occupancy and motion detectors: ultrasonic – microwave – capacitive detectors – triboelectric – optoelectronic motion sensors – optical presence sensor – Pressure Gradient sensors Velocity and acceleration sensors: Accelerometer characteristics – capacitive accelerometers – piezoelectric accelerometers – piezo resistive accelerometers – thermal accelerometers – Gyroscopes – piezoelectric cables – gravitational sensors.

Light Detectors: Photo diodes – photo transistor – photo resistor – cooled detectors – CCD and CMOS image sensors – thermal detectors – optical design – gas flame detectors

Radiation Detectors: scintillating detectors – ionization detectors – cloud and bubble chambers.

Temperature Sensors: coupling with objects – temperature reference points – thermo resistive sensors – thermo electric contact sensors – semiconductor sensors – acoustic sensors – piezoelectric sensors Chemical sensors: characteristics – classes of chemical sensors – biochemical sensors – multi-sensor arrays – electronic noses and tongues.

REFERENCES:

1. Jacob Fraden, “Handbook of Modern Sensors: Physics, Designs, and Applications”, Fourth Edition, Springer, 2010.
2. Jon Wilson, “Sensor Technology Handbook”, 1st Edition, Elsevier, Dec 2004.
3. D.Patranabis, “Sensors and Transducers‟, Prentice Hall of India, 2004.
4. John Vetelino, AravindReghu, “Introduction to Sensors”, CRC Press 2010.

5. John P. Bentley, “Principles of Measurement Systems”, 4th Edition,Pearson Education, 2005.
6. E.A. Doebelin, “Measurement Systems – Applications and Design”, Tata McGraw Hill, New York, 2012.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Explain the sensor characteristics, physics of sensors and optical components of sensors.
2. Apply sensor interface electronics.
3. Understand about the various motion-related sensors
4. Know the use of differentlight and radiation detectors.
5. Learn the several features and characteristics of temperature sensors and chemical sensors.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	1	2	1	1	1	3	2	3
CO2	3	3	3	2	2	-	-	1	2	1	1	1	3	3	2
CO3	3	3	3	2	2	-	-	1	2	1	1	1	3	2	3
CO4	3	3	3	3	2	-	-	1	2	1	1	1	3	2	2
CO5	3	2	3	3	2	-	-	1	2	1	1	1	3	3	2

		L	T	P	C
ITITPESCN	**ADVANCED WIRELESS AND MOBILE NETWORKS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- The students should get familiar with the wireless/mobile market and the future needs and challenges.
- To get familiar with key concepts of wireless networks, standards, technologies and their basic operations
- To learn how to design and analyse various medium access
- To learn how to evaluate MAC and network protocols using network simulation software tools.
- The students should get familiar with the wireless/mobile market and the future needs and challenges.

INTRODUCTION:

Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc.

WIRELESS LOCAL AREA NETWORKS:

IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues

WIRELESS CELLULAR NETWORKS:

1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.

WiMAX (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview

WIRELESS SENSOR NETWORKS

Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.

WIRELESS PANs

Bluetooth AND Zigbee, Introduction to Wireless Sensors,.

SECURITY

Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication.

ADVANCED TOPICS

IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks

REFERENCES:

1. Schiller J., Mobile Communications, Addison Wesley 2000

2. Stallings W., Wireless Communications and Networks, Pearson Education 2005

3. Stojmenic Ivan, Handbook of Wireless Networks and Mobile Computing, John Wiley and Sons Inc 2002

4. Yi Bing Lin and Imrich Chlamtac, Wireless and Mobile Network Architectures, John Wiley and Sons Inc 2000

5. Pandya Raj, Mobile and Personal Communications Systems and Services, PHI 200

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases.
2. Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
3. Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
4. Design wireless networks exploring trade-offs between wire line and wireless links.
5. Develop mobile applications to solve some of the real world problems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	1	-	1	1	2	1	-	1	3	1	-
CO2	3	3	2	2	1	-	1	1	2	-	-	1	2	-	-
CO3	3	3	2	2	2	1	1	1	1	1	1	1	3	-	-
CO4	-	-	2	1	-	1	1	1	-	1	1	1	3	-	-
CO5	3	-	-	-	1	-	-	1	-	-	1	1	2	1	-

		L	**T**	**P**	**C**
ITITPESCN	**DATA WAREHOUSING AND MINING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- The objective of this course is to introduce data warehousing and mining techniques.
- To understand various tools of Data Mining and their techniques to solve the real time problems.
- To acquireknowledge about the process of mining, Classification, prediction and Association rule mining and its application in Data Mining.
- Application of data mining in web mining, pattern matching and cluster analysis.
- To study recent trends in Distributed Warehousing and Data Mining.

Introduction to Data Warehousing; Data Mining: Mining frequent patterns, association and correlations; Sequential Pattern Mining concepts, primitives, scalable methods.

Classification and prediction; Cluster Analysis – Types of Data in Cluster Analysis, Partitioning methods, Hierarchical Methods; Transactional Patterns and other temporal based frequent patterns.

Mining Time series Data, Periodicity Analysis for time related sequence data, Trend analysis, Similarity search in Time-series analysis.

Mining Data Streams, Methodologies for stream data processing and stream datasystems, Frequent pattern mining in stream data, Sequential Pattern Mining in Data Streams, Classification of dynamic data streams, Class Imbalance Problem; Graph Mining; Social Network Analysis.

Web Mining, Mining the web page layout structure, mining web link structure,mining multimedia data on the web, Automatic classification of web documentsand web usage mining; Distributed Data Mining.

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis.

REFERENCES:

1. Jiawei Han and M Kamber, Data Mining Concepts and Techniques, Second Edition, Elsevier Publication, 2011.
2. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley,2006.
3. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Learn the concepts of Data Warehousing and Data Mining.
2. Study different sequential pattern algorithms.
3. Train the techniques to extract patterns from time series data and their application in real world.
4. Extend the graph mining algorithms to web mining.
5. Identify the computing framework for Big Data.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	2	2	1	1	1	1	2	1	1	3	2	3
CO2	3	3	2	2	2	1	1	1	1	2	1	1	3	3	2
CO3	3	2	2	2	2	1	1	1	1	2	1	1	3	2	3
CO4	3	3	2	2	2	1	1	1	1	2	1	2	3	2	2
CO5	3	3	2	2	1	1	1	1	1	2	1	2	3	3	2

ITITPESCN	ADVANCED MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce key concepts of pattern recognition and machine learning
- To understand specific algorithms for classification, regression, clustering and probabilistic modeling.
- To give a broad view of the general issues arising in the application of algorithms to analysing data.
- To demonstrate techniques that can be immediately applied to real world problems, or used as a basis for future research.

Key concepts – Supervised and Unsupervised Learning - Loss functions and generalization - Probability Theory - Parametric vs Non-parametric methods - Elements of Computational Learning Theory - Ensemble Learning – Bagging – Boosting - Random Forest.

Kernel Methods for non-linear data - Support Vector Machines - Kernel Ridge Regression - Structure Kernels - Kernel PCA - Latent Semantic Analysis.

Bayesian methods for using prior knowledge and data - Bayesian inference, Bayesian Belief Networks - Graphical models - Probabilistic Latent Semantic Analysis - The Expectation-Maximisation (EM) algorithm - Gaussian Processes.

Dimensionality Reduction – CCA – LDA – ICA - NMF – Canonical Variates - Feature Selection vs Feature Extraction.

Filter Methods - Sub-space approaches - Embedded methods - Low-Rank approaches - Recommender Systems. Application areas: Security - Business – Scientific.

Recent trends in supervised and unsupervised learning algorithm - dimensional reducibility - feature selection and extraction.

REFERENCES:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning.
2. John Shawe-Taylor and Nello Cristianini, Kernel Methods for Pattern Analysis.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the key concepts, tools and approaches for pattern recognition on complex data sets.
2. Apply kernel methods for handling high dimensional and non-linear patterns.
3. Understand state-of-the-art machine learning algorithms and dimensionality reduction techniques.
4. Be familiar with the steps involved in developing pattern recognition systems.
5. Solve real-world problems using machine learning techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO5	3	3	3	3	3	3	2	-	-	-	-	-	-	3	3

ITITPESCN	**NATURE INSPIRED METAHEURISTIC OPTIMIZATION ALGORITHMS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES

- To give students knowledge of non-traditional optimization and fundamentals of metaheuristic optimization algorithms.
- To study about Genetic algorithms, PSO, Artificial Ant and Bee algorithms.
- To introduce multiobjective optimization.

Introduction- Optimization - Search for Optimality-Biological and artificial evolution - Evolutionary computation and AI - brief history of metaheuristics - Simulated Annealing - Annealing and Boltzmann distribution - unconstrained optimization - Constraint handling - method of Lagrange multipliers - penalty approach - repair methods.

Genetic Algorithms: Historical development, GA concepts – encoding, fitness function, population size, selection, crossover and mutation operators, along with the methodologies of applying these operators. Binary GA and their operators, Real Coded GA and their operators - applications to real world problems.

Differential Evolution: DE as modified GA, generation of population, operators and their implementation.

Particle Swarm Optimization: PSO Model, global best, Local best, velocity update equations, position update equations, velocity clamping, inertia weight, constriction coefficients - accelerated PSO.

Artificial Ant and Bee Algorithms: Behaviour of Ants - Ant Colony Optimization- behaviour of honey bees-artificial bee colony optimization.

Harmony Search Optimization - Firefly Algorithm - behaviour of fireflies - light intensity and attractiveness.

Multi-Objective Optimization: Linear and nonlinear multi-objective problems, convex and non – convex problems, dominance – concepts and properties, Pareto – optimality, Use of Evolutionary Computations to solve multi objective optimization, bi level optimization, Theoretical Foundations.

REFERENCES

1. Coello, C. A., Van Veldhuizen, D.A. and Lamont, G.B.: “Evolutionary Algorithms for solving Multi Objective Problems”, Kluwer. 2002
2. Deb, K.: “Multi-Objective Optimization using Evolutionary Algorithms”, John Wiley and Sons. 2002
3. Deb, K.: “Optimization for Engineering Design Algorithms and Examples”, Prentice Hall of India. 1998
4. Goldberg and David E, "Genetic Algorithms in Search. Optimization and Machine Learning", Pearson Education, New Delhi, 2006.
5. Xin-She Yang, Nature-Inspired Metaheuristic Algorithms, Luniver Press. 2010.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Identify and describe metaheuristic algorithms and their roles in solving optimization problems
2. Apply the metaheuristic algorithms in solving various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems
4. Evaluate and compare solutions by various metaheuristic optimization approaches for a given problem.
5. Use evolutionary computations to solve multi-objective problems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	3	1	-	-	3	-	-
CO2	-	3	3	3	3	1	-	-	-	-	-	-	-	3	-
CO3	3	3	-	-	-	-	-	1	3	2	-	-	-	3	-
CO4	-	3	-	-	-	-	-	-	3	2	-	-	-	-	2
CO5	-	-	-	-	-	-	3	-	2	-	1	2	-	-	2

		L	T	P	C
ITITPESCN	**DIGITAL IMAGE AND VIDEO PROCESSING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES

- To study about Digital Image and Video Fundamentals
- To study about Image and Video Enhancement, Restoration, Segmentation and Compression
- To study about Colour Image processing
- To study about Object Recognition

Digital Image and Video Fundamentals : Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms - Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

Image and Video Enhancement and Restoration : Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, deinterlacing, video resolution enhancement, Image and Video restoration (recovery).

Image and Video Segmentation : Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

Colour image Processing : Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing Image and Video Compression : Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

Object recognition : Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

REFERENCES

1. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
2. J. W. Woods, "Multidimensional Signal, Image and Video Processing and Coding",2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods," Digital Image Processing", 3rd Edition, Prentice Hall, 2008.
4. A. M. Tekalp, "Digital Video Processing", 2nd Edition, Prentice Hall, 2015.
5. S. Shridhar, "Digital Image Processing", 2nd Edition, Oxford University Press, 2016.

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

1. Learn fundamentals of image and video processing
2. Apply how to restore the data in image and video using different techniques
3. Apply the different segmentation techniques in images and videos
4. Design colour image processing
5. Recognize the objects using classifiers

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO2	3	3	-	-	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	-	-	3	1	-	-	1	1	-	-	3	-	-
CO4	-	-	3	-	3	-	1	-	2	-	2	2	-	3	-
CO5	-	-	-	-	-	3	1	-	2	-	3	-	-	-	3

		L	T	P	C
ITITPESCN	**ETHICAL HACKING AND NETWORK DEFENSE**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn about ethical hacking
- To understand the hacking networks and vulnerabilities
- To be familiar with hacking applications

ETHICAL HACKING AND SOCIAL ENGINEERING : Introduction - Certified Ethical Hackers – Network and Computer Attacks – Ethical Hacking Plan – Hacking Methodology. Footprinting Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering – Performing Social Engineering Attacks – Social Engineering Countermeasures

SERVICE SCANNING : Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps - Shell Scripting. Enumeration: Introduction - Enumerating Windows, Symbian, Java OS, Android and NetWare Operating Systems

HACKING NETWORKS : Hacking Web Servers: Web Application – Web Application Vulnerabilities – Tools for Web Attackers and Security Testers. Hacking Wireless Network: Wireless Technology – Wireless Network Standards – Authentication – Wardriving – Wireless Hacking – Protecting Networks with Security Devices.

HACKING OPERATING SYSTEMS : Windows: Vulnerabilities – Choosing Tools – Information Gathering – RPC – Null Sessions – Share Permissions – Hardcore Vulnerability Exploitation. Linux: Vulnerabilities – Information Gathering – Unconnected Services - .rhosts and hosts.equiv Files – NFS – File Permissions – Buffer Overflow.

HACKING APPLICATIONS : Messaging Systems – Web Applications – Mobile Applications - Databases - Reporting Results

REFERENCES:

1. Michael T. Simpson, “Ethical Hacking and Network Defense”, Cengage Learning, New Delhi, 2010.
2. Kevin Beaver, “Hacking for Dummies”, Wiley Publication, India, 2007.
3. Ankit Fadia, “Unofficial Guide to Ethical Hacking”, Macmillan Company, New Delhi, 2001.
4. Stuart McClure, Joel Scambray and Goerge Kurtz, “Hacking Exposed Network Security Secrets & Solutions”, Tata Mcgrawhill Publishers, 2010.
5. Bensmith, and Brian Komer, “Microsoft Windows Security Resource Kit”, Prentice Hall of India, 2010

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand various ethical hacking and social engineering measures..
2. To analyze the various types of service scanning and operating system.
3. To know about various hacking networks.
4. Have an idea about the various vulnerabilities.
5. Describe the various hacking applications in the real world.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	3	-	-	-	-	-	-	-	1	2	-
CO3	2	-	2	-	3	-	-	-	-	-	2	-	-	3	2
CO4	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	1	-	2	-	3	-	-	-	-	-	2	-	-	2	2

ITITPESCN	**DIGITAL FORENSICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
- Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.

- Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
- E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

Digital Forensics Science: Forensics science, computer forensics, and digital forensics.

Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.

Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case

Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.

Mobile Forensics: mobile forensics techniques, mobile forensics tools.

Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

REFERENCES:

1. John Sammons, “The Basics of Digital Forensics”, Elsevier
2. John Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Laxmi Publications

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Describe the various basic digital forensics science
2. Understand relevant legislation and codes of ethics.
3. Analyze various processes, policies and procedures of computer forensics
4. Understand E-discovery, guidelines and standards, E-evidence, tools and environment
5. Gain knowledge on network and Mobile forensics.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	2
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO4	2	-	3	-	2	-	-	-	-	-	-	-	-	2	2
CO5	3	-	3	-	3	-	-	-	-	-	2	-	-	2	2

		L	T	P	C
ITITPESCN	**COMPUTER VISION**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- Be familiar with both the theoretical and practical aspects of computing with images.
- Have described the foundation of image formation, measurement, and analysis.
- Understand the geometric relationships between 2D images and the 3D world.
- Grasp the principles of state-of-the-art deep neural networks.

Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.

Edge detection, Edge detection performance, Hough transform, corner detection, Segmentation, Morphological filtering, Fourier transform

Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data preprocessing

Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non- parametric methods.

Recent trends in Activity Recognition, computational photography, Biometrics.

REFERENCES:

1. Computer Vision: Algorithms and Applications by Richard Szeliski.
2. Deep Learning, by Goodfellow, Bengio, and Courville.
3. Dictionary of Computer Vision and Image Processing, by Fisher et al.

COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Understand and master basic knowledge, theories and methods in computer vision.
2. Identify, formulate and solve problems in computer vision.
3. Analyze, evaluate and examine existing practical computer vision systems.
4. Design and develop practical and innovative computer vision applications or systems.
5. Authenticating the Recent Trends.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	-	2	-	-	1	-	-	-	-	-	-	2	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	3	-	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	-	2	1	3	-	1	-	1	-	-	-	-	-	1	-

OPEN ELECTIVES

ITITOESCN	WEB INTEGRATED TECHNOLOGIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the issues in the design of web application development.
- To learn the concepts of client side and server side technologies.
- To learn the concept of three tier application using MVC.

Web Engineering and Application Development – Introduction – Challenges and Role of Web Engineering – Web Design Methods – Design Issues – OOWS Model Driven approach – OOHDM – UML based Web Engineering – Designing Multichannel Web Application – Designing Web Application with Web ML and Web Ratio – Semantic Web Information System - Quality Evaluation and Experimental Web Engineering.

Web Technology Basics – HTML5 – Cascading Style Sheet – Client side scripting – JavaScript – JavaScript Objects – XML Basics – DOM – SAX – XSL – AJAX – RSS – Database Connectivity – Server Side Scripting – Servlet – Servlet Life Cycle – Servlet based Web Application – JSP – PHP – ASP.NET – Case Study.

Three Tier Architecture – Working With Model-View-Controller – JCP – J2EE - XML Based APIs – Application Servers - Presentation Tier and EIS Tier – Java Mail – JMS – Java Transactions – JNDI – Java Authentication and Authorization Services – Java Cryptography.

Service Tier And Data Tier – EJB Architecture – Session Beans – Entity Beans – Message Driven Beans – J2EE Connector Architecture - Web Services – J2EE Web Services – Patterns –Presentation, Service Tier and Data Tier Patterns – J2ME - Struts – Hibernate – Spring.

SOA Principles – Evolution of SOA – SOA and WS_Extension – Service Activity – Coordination – Transaction – Orchestration – Choreography – Security – Advanced Messaging - Notification and Eventing - Case Studies – Current Trends.

REFERENCES:

1. Gustavo Rossi, Oscar Pastor, Daniel Schwabe, Luis Olsina, “Web Engineering Modeling and Implementing web Applications”, Springer, 2008.
2. Thomas Erl, “Service Oriented Architecture, Concepts, Technology, and Design”, Pearson,2005.
3. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2003.
4. Freunk P.Coyle, XML, web Services and the Data Revolution, Pearson, 2002.
5. C. Xavier, “Web Technology & Design”, New Age International, 2007.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Design and development of web applications using various models
2. Web application development using HTML and scripting technologies
3. To analyze various Authentication and Authorization Services
4. To analyze the sustainable web development and design methodology
5. Web application development using advanced features.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	-	-	-	-	-	-	-	-	-	-	3	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	2	-	3	-	-	-	-	-	-	-	-	2	3
CO4	-	1	3	-	2	-	-	-	-	-	-	-	-	-	-
CO5	-	-	3	-	3	-	-	-	-	-	-	-	-	2	2

ITITOESCN	DECISION MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand how Decision Management Systems can transform the business.
- To plan the systems with the decision in mind.
- To identify, model and prioritize the decisions.
- To study design and implement decision services
- To study the rules of business management system.

Principles of Decision Management Systems - Begin with the Decision in Mind - Be Transparent and Agile - Be Predictive, Not Reactive - Test, Learn, and Continuously Improve.

Building Decision Management Systems - Discover and Model Decisions - Characteristics of Suitable Decisions - A Decision Taxonomy - Finding Decisions - Documenting Decisions Prioritizing Decisions.

Design and Implement Decision Services - Build Decision Services - Integrate Decision Services - Best Practices for Decision Services Construction - Monitor and Improve Decisions - What Is Decision Analysis? - Monitor Decisions - Determine the Appropriate Response - Develop New Decision-Making Approaches - Confirm the Impact Is as Expected - Deploy the Change.

Enablers for Decision Management Systems - People Enablers - The Three-Legged Stool - A Decision Management Center of Excellence - Organizational

Change - Process Enablers - Managing a Decision Inventory - Adapting the Software Development Lifecycle - Decision Service Integration Patterns - Moving to Fact-Based Decisioning - The OODA Loop - Technology Enablers.

Business Rules Management Systems - Predictive Analytics Workbenches - Optimization Systems - Pre-Configured Decision Management Systems - Data Infrastructure - A Service Oriented Platform.

REFERENCES:

1. James Taylor, Decision Management Systems-A Practical guide to using Business rules and Predictive Analytics, IBM Press, 2012.
2. Efraim Turban, Jay E. Aronson, Ting-Peng Liang, Decision Support Systems & Intelligent Systems, 9th edition, Prentice Hall, 2010.
3. Alberto Cordoba, Understanding the Predictive Analytics Lifecycle, Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die, Wiley, 2013.
5. George M Marakas, Decision support Systems, 2nd Edition, Pearson/Prentice Hall, 2002
6. V.S. Janakiraman, K. Sarukesi, ―Decision Support Systems", PHI, ISBN8120314441, 9788120314443, 2004.
7. Efrem G Mallach, ―Decision Support systems and Data warehouse Systems, McGraw Hill, thirteenth reprint, 2008.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Design and implement robust decision services.
2. Monitor ongoing decision-making.
3. Learn methods to improve decision making performance.
4. Understand and knowledge of enablers involve decision management system.
5. Understand the rules of business management decision system.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	1	1	-	1	1	-	1	1	1	3	-	-
CO2	3	3	2	-	-	2	-	1	2	1	1	1	2	2	-
CO3	3	-	2	2	-	-	2	-	2	2	1	1	3	-	-
CO4	3	2	2	1	-	-	1	1	-	-	1	1	3	-	-
CO5	3	-	-	-	-	2	2	1	1	1	1	1	2	1	-

ITITOESCN	CYBER FORENSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the fundamentals of computer forensics.
- To have an overview of techniques for Data Recovery and Evidence Collection.
- To study various threats associated with security and information warfare.
- To study the tools and tactics associated with cyber forensics.

Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Vendor and Computer Forensics Services.

Data Recovery Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events Fighting against Macro Threats – Information Warfare Arsenal – Tactics of the Military – Tactics of Terrorist and Rogues – Tactics of Private Companies.

Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime Identity Theft and Identity Fraud – Organized Crime & Terrorism Avenues Prosecution and Government Efforts – Applying the First Amendment to Computer Related Crime – The Fourth Amendment and Other Legal Issues.

Developing Forensic Capabilities – Searching and Seizing Computer Related Evidence – Processing Evidence and Report Preparation – Future Issues.

REFERENCES:

1. John R. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Volume1, Cengage Learning, 2005.
2. Marjie T Britz , “Computer Forensics and Cyber Crime: An Introduction”, 3/E,Pearson Education, 2013.
3. Marie-Helen Maras, “Computer Forensics: Cybercriminals, Laws, and Evidence”, Jones & Bartlett Publishers, 2011.
4. Chad Steel, “Windows Forensics”, Wiley India, 2006.
5. Majid Yar, “Cybercrime and Society”, Sage Publications, 2006.
6. Robert M Slade, “Software Forensics”, Tata Mc Graw Hill, 2004.

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to

1. Classify the types of computer forensic services.
2. Collect and preserve digital data evidence.
3. Use techniques for Data Recovery and Electronic evidence.
4. Handle the threats associated with information warfare.
5. Apply surveillance tools and tactics associated with cyber forensics.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	3	1	1	3	-	-	-	2	2	1	2	3	2	2
CO2	1	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO3	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO4	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2
CO5	2	3	1	3	3	-	-	-	2	2	1	2	3	2	2

ITITOESCN	**DATA SCIENCE AND ANALYTICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To introduce fundamental techniques and tools required for data science and analytics.
- To learn the basics of statistical analysis and important machine learning algorithms.
- To learn the architecture of Hadoop and important components of Hadoop Ecosystem.
- To analyze real world data using data analytics tools and techniques learnt so far.

Introduction to Data Science – Applications - Data Science Process – Exploratory Data analysis – Collection of data – Graphical presentation of data – Classification of data – Storage and retrieval of data – Big data – Challenges of Conventional Systems - Web Data – Evolution Of Analytic Scalability - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.

Correlation – Regression – Probability – Conditional Probability – Random Variables – Analysis using Mean, Median, Mode, Standard Deviation, Skewness, Kurtosis- Regression Modeling - Multivariate Analysis - Bayesian Modeling - Inference and Bayesian Networks - Support Vector and Kernel Methods - Analysis of Time Series: Linear Systems Analysis - Nonlinear Dynamics.

Rule Induction - Neural Networks: Learning and Generalization - Competitive Learning - Principal Component Analysis and Neural Networks - Fuzzy Logic: Extracting Fuzzy Models from Data - Fuzzy Decision Trees - Stochastic Search Methods- Neuro-Fuzzy Modelling – Association rule mining – Clustering – Outlier

Analysis – Sequential Pattern Mining – Temporal mining – Spatial mining – Web mining.

Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform (RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

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

REFERENCES:

1. XMichael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets" Cambridge University Press, 2012.
3. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & Sons, 2012.
4. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
5. Rachel Schutt, Cathy O'Neil, "Doing Data Science", O'Reilly Publishers, 2013.
6. Foster Provost, Tom Fawcet, "Data Science for Business", O'Reilly Publishers, 2013.
7. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014.
8. S. N. Sivanandam, S. N Deepa, "Introduction to Neural Networks Using Matlab 6.0", Tata McGraw- Hill Education, 2006.

COURSE OUTCOMES:

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

1. Understand the importance and fundamental concepts of data science and analytics.
2. Interpret the statistical theory applicable for data analytics and classification algorithms.
3. Apply neural networks, fuzzy logic, and mining techniques to analyze the data and convert data into actionable predictions.
4. Analyze streaming data and develop applications with real time data.
5. Understand the architecture of Hadoop framework and develop data analytics based applications using Hadoop Ecosystem.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	1	-	-	-	-	-	-	-	-	3	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	3
CO4	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3
CO5	3	3	3	3	3	2	2	-	-	-	-	-	-	3	3

		L	T	P	C
ITITOESCN	**PATTERN RECOGNITION**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To equip students with basic mathematical and statistical techniques commonly used in pattern recognition.
- To understand the concepts of a pattern and the basic approach to the development of pattern recognition algorithms.
- To understand and apply parametric and non-parametric methods to detect and characterize patterns in real-world data.
- To introduce different unsupervised learning algorithms.

Review of probability theory: conditional probability - Bayes theorem - random variables - distribution function - expectation and variance - joint distribution function of multiple random variables - normal distribution.

Introduction to pattern recognition system: design cycle - introduction to feature extraction and classification - types of learning. Bayesian decision theory - Bayes Classifier - Discriminant functions - Minimum-error-rate classification.

Parameter estimation methods: Maximum-Likelihood estimation - Gaussian mixture models - Bayesian estimation - Expectation maximization method - Hidden Markov models - Dimension reduction methods - Fisher discriminant analysis - Principal component analysis.

Non-parametric techniques for density estimation and pattern classification: Parzen-window method - K-Nearest Neighbour method - linear discriminant analysis - Support vector machines.

Unsupervised learning and clustering: linear least square regression - Criterion functions for clustering - Algorithms for clustering: Hierarchical and other methods, Cluster validation.

REFERENCES:

1. S. M. Ross, Introduction to Probability models, Academic Press, 2010.

2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001.
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
4. Nasrabadi, Nasser M. "Pattern recognition and machine learning." Journal of electronic imaging 16.4 (2007): 049901.
5. Anzai, Yuichiro. Pattern recognition and machine learning. Elsevier, 2012.
6. Fu, K. C., ed. Sequential methods in pattern recognition and machine learning. Vol. 52. Academic press, 1968.

COURSE OUTCOMES:

After successful completion of this course, student will be able to

1. Understand machine learning concepts and range of problems that can be handled by machine learning.
2. Identify where, when and how pattern recognition can be applied.
3. Compare various parametric learning algorithms and apply suitable algorithms in real world problems.
4. Gain sufficient background necessary to develop non-parametric methods based pattern recognition systems.
5. Understand unsupervised methods of pattern recognition and apply them to real world data.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1	-	-	-	-	-	-	-	-	3	2
CO2	3	3	3	2	2	-	-	-	-	-	-	-	-	3	2
CO3	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	2
CO5	3	3	3	3	3	2	1	-	-	-	-	-	-	3	3

		L	T	P	C
ITITOESCN	**HUMAN COMPUTER INTERACTION**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn the principles and fundamentals of human computer interaction (HCI), and analyze HCI theories as they relate to collaborative or social software.
- To establish target users, functional requirements, and interface requirements for a given computer application.
- To understand user interface design principles, and apply them to designing an interface.
- To learn user interface designs through usability inspection and user models.
- To know the applications of multimedia on HCI.

Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

Recent Trends: Speech Recognition and Translation, Multimodal System

REFERENCES:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004
2. Brian Fling, “Mobile Design and Development”, First Edition , O Reilly Media Inc., 2009
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O Reilly, 2009.

COURSE OUTCOMES:

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

1. Explain the capabilities of both humans and computers from the view point of human information processing
2. Describe typical human computer interaction (HCI) models, styles and various historic HCI paradigms
3. Apply an interactive design process and Universal design principles to design HCI systems
4. Understand the important aspects of implementation of Human Computer Interface
5. Identify various tools and techniques for interface analysis, design and evaluation

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	-	2	-	-	-	-	-	1	-	-	2	-	-
CO2	2	2	1	-	3	-	-	-	-	-	-	-	2	-	-
CO3	1	-	2	-	3	-	3	-	-	3	-	-	-	2	-
CO4	-	3	-	3	-	-	2	-	-	-	-	-	1	2	-
CO5	2	2	3	3	3	3	3	1	-	3	-	-	-	3	-

ITITOESCN	**MOBILE APPLICATION DEVELOPMENT**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To learn the characteristics of mobile applications.
- To understand the intricacies of UI required by mobile applications.
- To study about the design aspects of mobile application.
- To learn about modern mobile operating systems.
- To learn about the services provided by mobile device.

Mobile Applications – Characteristics and Benefits – Application Model – Infrastructure and Managing Resources – Mobile Software Engineering – Frameworks and Tools – Mobile devices Profiles.

Generic UI Development – VUIs and Mobile Applications – Text to Speech techniques – Designing the right UI – Multimodal and Multichannel UI – Gesture based UIs – Screen Elements and Layouts – Voice XML – Java API.

Memory Management – Design patterns for limited memory – Work flow for Application Development – Techniques for composing Applications – Dynamic Linking – Plug ins and rules of thumb for using DLLs – Concurrency and Resource Management – Look and feel.

Intents and Services – Storing and Retrieving data – Communication via the Web – Notification and Alarms – Graphics and Multimedia – Telephony – Location based services – Packaging and Deployment – Security and Hacking.

Google Android Platform – Eclipse Simulator – Android Application Architecture – Event based programming – Apple iPhone Platform – UI tool kit interfaces – Event handling and Graphics services – Layer Animation.

REFERENCES:

1. Zigurd Mednieks, Laird Dornin, G, Blake Meike and Masumi Nakamura, “Programming Android”, O’Reilly, 2011.
2. Reto Meier, Wrox Wiley, “Professional Android 2 Application Development”, 2010.
3. Alasdair Allan, “iPhone Programming”, O’Reilly, 2010.
4. Wei-Meng Lee, “Beginning iPhone SDK Programming with Objective-C”, Wrox Wiley, 2010.
5. Stefan Poslad, “Ubiquitous Computing: Smart Devices, Environments and interactions”, Wiley, 2009.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. To learn the characteristics of mobile applications
2. To understand the intricacies of UI required by mobile applications
3. To study about the design aspects of mobile application
4. Gain knowledge about mobile application distribution
5. Develop an mobile application

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	1	-	-	1	-	-	-	-	-	3	1	-
CO2	-	3	2	2	-	-	3	-	-	-	-	-	-	1	-
CO3	-	-	3	2	1	-	-	-	-	-	-	-	-	2	-
CO4	3	-	1	1	-	-	-	-	-	-	-	-	1	2	1
CO5	2	2	3	3	3	3	1	1	3	3	-	-	-	3	1

		L	T	P	C
ITITOESCN	**INFORMATION RETRIEVAL**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the basics of Information Retrieval with pertinence to modeling, Query operations and indexing.
- To get an understanding of machine learning techniques for text classification and clustering.
- To study experimental evaluation information retrieval.

- To study the information retrieval text categorization and clustering.
- Understand information retrieval recommender system.

Introduction - Goals and history of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR – Basic IR Models Boolean and vector space retrieval models – Ranked Retrieval – Text similarity metrics –TF IDF (term frequency/inverse document frequency) weighting - Cosine Similarity.

Basic Tokenizing - Indexing and Implementation of Vector Space Retrieval - Simple tokenizing – stop word removal and stemming – Inverted Indices –Efficient processing with sparse vectors – Query Operations and Languages - Relevance feedback – Query expansion – Query languages.

Experimental Evaluation of IR Performance Metrics Recall, Precision and F measure – Evaluations on benchmark text collections - Text Representation - Word statistics – Zipf's law – Porter stemmer - Morphology – Index term Selection using thesauri -Metadata and markup languages- Web Search engines – spidering – metacrawlers – Directed spidering – Link analysis shopping agents.

Text Categorization and Clustering - Categorization algorithms - Naive Bayes – Decision trees and nearest neighbor- Clustering algorithms - Agglomerative clustering – k Means – Expectation Maximization (EM) - Applications to information filtering – Organization and relevance feedback.

Recommender Systems - Collaborative filtering - Content based recommendation of documents and products - Information Extraction and Integration - Extracting data from text – XML – semantic web – Collecting and integrating specialized information on the web.

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Ricci, F. Rokach, L. Shapira, B. Kantor, P.B. “Recommender Systems Handbook”, 1st Edition, 2011.
3. Brusilovsky, Peter, “The Adaptive Web Methods and Strategies of Web Personalization”, Springer, 2007.
4. Baeza-Yates, Ricardo, and Berthier Ribeiro-Neto. Modern information retrieval. Vol. 463. New York: ACM press, 1999.
5. Crestani, Fabio, Mounia Lalmas, and Cornelis Joost van Rijsbergen, eds. Information Retrieval: Uncertainty and Logics: Uncertainty and Logics: Advanced Models for the Representation and Retrieval of Information. Vol. 4. Springer Science & Business Media, 1998.

6. Heiner Stuckenschmidt, Frank van Harmelen, “Information Sharing on the Semantic Web”, Springer International Edition, ISBN 3-540-20594-2, 2005.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand the various applications of Information Retrieval such as Multimedia IR, Web Search.
2. Understand the concepts of digital libraries
3. Understand the collecting and integrating specialized information on the web.
4. Train to reduce the clustering data in organization.
5. Understanding the evolution of information retrieval.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	1	1	-	-	-	1	-	-	-	3	-
CO2	3	3	2	2	1	-	-	1	-	-	-	-	-	2	-
CO3	3	3	2	2	2	1	-	1	-	-	-	-	3	-	-
CO4	3	2	2	1	2	-	1	1	1	-	-	2	3	-	-
CO5	3	2	2	1	1	-	-	1	-	-	-	2	2	1	-

ITITOESCN	**MIDDLEWARE FOR COMMUNICATIONS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand the middleware technologies and communication protocols for distributed, dependable, and real-time systems.
- To understand the middleware and/or communication protocols.
- To understand a distributed architecture according to distributed communication requirements.
- To understand real-time communication protocols for distributed dependable systems.
- To understand middleware approaches for WSN.

Introduction, what is Middleware, The Evolution of Middleware, Overview of Middleware, Limitations of Conventional Middleware, Middleware Challenges, Categories of middleware: Message oriented middleware.

Transaction Processing Fundamentals Isolation Levels, Optimistic Concurrency Control, Transaction APIs, Container Managed Transactions, Messaging Transactions, Queued Transaction Processing, Web Transactions, Advanced Transactions.

Peer-to-Peer Middleware Peer-to-peer & Grids, Lack of Peer-to-peer Middleware, Peer Groups, Services & Modules, Protocols, Messages & pipes, Security, Quality of Service, Applications using and Enhancing Grid Middleware.

Model Driven Middleware Overview of the OMG Model Driven Architecture (MDA), Capabilities of the MDA, Benefits of the MDA, Overview of Model Driven Middleware, Limitations of Using Modeling and Middleware in Isolation, Combining Model Driven Architecture and QoS-enabled Component Middleware.

Real-time CORBA Middleware: DRE System Technology Challenges, Challenges of Today's DRE Systems, Challenges of Future DRE Systems, Limitations with Conventional DRE System Development, Overview of Real-time CORBA, Overview of CORBA, Overview of Real-time CORBA 1.0, Overview of Real-time CORBA 2.0.

REFERENCES:

1. K. Sohraby, D. Minoli, and T. Znati, “Wireless Sensor Networks: Technology, Protocols, and Applications”, John Wiley & Sons, March 2007.
2. Qusay H. Mahmoud, “Middleware for Communications”, John Wiley & Sons, 2004.
3. Misra Sudip, Woungam, Isaac Misra, Subhas Chandra, “Guide to wireless sensor networks”, Computer Communications and networks Springer link Verlag, 2009.
4. Luis Redondo-López, Aggeliki Prayati, Juan-Manuel LópezNavarro, José-Fernán Martínez-Ortega and Ana-Belén García-Hernando, “Problem solving for wireless sensor networks”, Springer Verlag, 2008.
5. Levente Buttyan,Dennis Gessner,Alban Hessler, Peter Langendoerfer “Application of wireless sensor networks in critical infrastructure protection: Challenges and design options”, IEEE Wireless Communications, Vol 14 issue 5, Pg.44-49 ,October 2010.
6. Tarik Taleb,Dario Bottazzi and Nidal Nasser, “ A Novel Middleware Solution to Improve Ubiquitous Healthcare Systems Aided by Affective Information”, IEEE Transactions on Information Technology in Biomedicine,Vol.14,No.2,March 2010.
7. Yoonsik Uhm,Minsoo Lee, “Development of Portable Intelligent Gateway system for ubiquitous entertainment and location – aware Push services” ,IEEE transactions on Consumer electronice,Vol.56,No.1, February 2010.
8. Eduardo Canete, Jaime Chen, Manuel Diaz, Luis Liopis, Bartolome Rubio, “A service oriented approach to facilitate WSAN application development”, Adhoc networks, Elsevier, 2010.

9. Wouter horre, Sam Michiels, Wouter Joosen, Pierre Verbaeten, Katholieke University, “DAVIM: Adaptable Middleware for Sensor Networks”, IEEE distributed systems online vol.9, issue 1, 2008.
10. Min chen, Sergio Gonzalez and Victor C.M.Leung, “Applications and design issues for mobile agents in WSN”, IEEE wireless communications, vol 14, issue 6, pages 20-26, December 2007.
11. Hitha Alex Mohan Kumar, Berouoz Shirazi, “Midfusion: An adaptive middleware for information fusion in sensor network applications”, Information Fusion, Elsevier. Vol 9, issue no3, Pg no:332-343, 2008.
12. Miaomiao, Jiannong Cao, Jing Li and Sajal K Dasi, “Middleware for Wireless Sensor networks”, Journal of Computer Science and Technology, Springer link, Volume no 23, number 3, 305-326, May 2008.
13. References - http://www.dre.vanderbilt.edu/~schmidt/PDF/.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Implement the middleware technologies.
2. Implement the communication protocols for distributed communications.
3. Implement the real-time systems.
4. Implement the advanced applications
5. Implement the real time applications

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	2	-	-	-	2	-	-	3	-	-
CO2	3	3	3	3	-	2	-	-	-	-	-	-	-	3	2
CO3	3	3	3	3	-	2	2	-	2	-	-	-	2	-	2
CO4	3	3	3	3	-	3	-	-	-	-	-	2	2	-	2
CO5	3	3	3	3	-	2	-	-	-	-	-	2	2	-	3

AUDIT COURSE – I & II

ITITACSCN	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

Students will be able to:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in

Introduction Disaster: Definition, Factors And Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

Repercussions of Disasters And Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.

Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches.

Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks of Disease And Epidemics, War And Conflicts.

Disaster Prone Areas In India : Study of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone to Cyclonic And Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases And Epidemics

Disaster Preparedness And Management : Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data From Meteorological And other Agencies, Media Reports: Governmental And Community Preparedness.

Risk Assessment : Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.

Disaster Mitigation Meaning: Concept and Strategies of Disaster Mitigation, Emerging Trends in Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation In India.

REFERENCES:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.), "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L., "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Demonstrate the significance of natural and man-made disasters.
2. Gain knowledge about disaster prone areas in India.
3. Understand post-disaster diseases/epidemics and their remedies.
4. Assess disaster risk and mitigation.

ITITACSCN	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects
- Enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

Alphabets in Sanskrit - Past/Present/Future Tense - Simple Sentences Order - Introduction of roots - Technical information about Sanskrit Literature Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

REFERENCES:

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi

2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

3. “India’s Glorious Scientific Tradition” Suresh Soni, Ocean books (P) Ltd., New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students

ITITACSCN	VALUE EDUCATION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism. - Moral and non- moral valuation. Standards and principles - Value judgements

Importance of cultivation of values - Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness - Honesty, Humanity. Power of faith, National Unity - Patriotism. Love for nature, Discipline

Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline - Punctuality, Love and Kindness - Avoid fault Thinking - Free from anger, Dignity of labour - Universal brotherhood and religious tolerance - True friendship - Happiness Vs suffering, love for truth - Aware of self-destructive habits - Association and Cooperation - Doing best for saving nature

Character and Competence –Holy books vs Blind faith - Self-management and Good health - Science of reincarnation - Equality, Nonviolence, Humility, Role of Women - All religions and same message - Mind your Mind, Self-control - Honesty, Studying effectively

REFERENCES:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality

ITITACSCN	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

History of Making of the Indian Constitution: History - Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution: Preamble Salient Features

Contours of Constitutional Rights & Duties: Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Organs of Governance: Parliament – Composition - Qualifications and Disqualifications - Powers and Functions – Executive – President – Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

Local Administration: District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayati raj: Introduction, PRI: ZilaPachayat - Elected officials and their roles, CEO ZilaPachayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning - Chief Election Commissioner and Election Commissioners - State Election Commission: Role and Functioning - Institute and Bodies for the welfare of SC/ST/OBC and women.

REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct.
4. Familiarize with elections through adult suffrage in the Indian Constitution.
5. Discuss the passage of the Hindu Code Bill of 1956.

ITITACSCN	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices: Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

Professional development: alignment with classroom practices and follow-up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

Research gaps and future directions : Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education, Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Understand what pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
2. Understand what is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners.
3. Learn how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

		L	T	P	C
ITITACSCN	**STRESS MANAGEMENT BY YOGA**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

- To achieve overall health of body and mind
- To overcome stress

Definitions of Eight parts of yog. (Ashtanga) Yam and Niyam

1. Do‘s and Don’t’s in life
   (i) Ahinsa, satya, astheya, bramhacharya and parigraha
   (ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
2. Asan and Pranayam
   (i) Various yog poses and their benefits for mind & body
   (ii) Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:

1. ‘Yogic Asanas for Group Tarining - Part-I” : Janardan Swami Yogabhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency

		L	T	P	C
ITITACSCN	**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

Neetisatakam - Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont’s)
- Verses- 71,73,75,78 (do’s)

Approach to day to day work and duties - Shrimad BhagwadGeeta :

- Chapter 2-Verses 41, 47,48
- Chapter 3-Verses 13, 21, 27, 35
- Chapter 6-Verses 5,13,17, 23, 35
- Chapter 18-Verses 45, 46, 48

Statements of basic knowledge - Shrimad BhagwadGeeta:

- Chapter 2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad Bhagwad Geeta:

- Chapter 2-Verses 17
- Chapter 3-Verses 36,37,42
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

REFERENCES:

1. “Srimad Bhagavad Gita” by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata
2. Bhartrihari’s Three Satakam (Niti-sringar-vairagya) by P.Gopinath
3. Rashtriya Sanskrit Sansthanam, New Delhi.

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
2. Lead the nation and mankind to peace and prosperity
3. Help in developing versatile personality