K.S. Rangasamy College of Technology

(Autonomous Institution)

Curriculum & Syllabus

of

B.E. Computer Science and Engineering
(For the batch admitted in 2011-12)

R 2010

Courses Accredited by NBA, Accredited by NAAC with 'A' Grade, Approved by AICTE, Affiliated to Anna University, Chennai.

**KSR Kalvi Nagar, Tiruchengode – 637 215.
Namakkal District, Tamil Nadu, India.**

Vision

To produce competent software professionals, academicians and researchers through Quality Education.

Mission

- To produce competent software developers, system designers and network programmers.

- To keep abreast of the latest developments and technological transformations in computer science and engineering for social benefits.

The Programme Educational Objectives of the department are:

I. Graduates of the programme will identify, formulate, analyze complex problems and provide effective solutions by applying the concepts of science, mathematics, engineering fundamentals and computing.

II. Graduates of the programme will be professionally competent and successful in their chosen career through life-long learning.

III. Graduates of the programme will contribute individually or as member of a team in handling projects and exhibit social responsibility and professional ethics

Programme Outcomes (POs)

(a) Apply the knowledge of mathematics, science, engineering fundamentals to the solution of complex problems in Computer Science and Engineering

(b) Identify, formulate, research literature and analyse complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

(c) Design solutions for complex Computer Science and 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

(d) 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 related to Computer Science and Engineering

(e) Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Computer Science and Engineering activities with an understanding of the limitations

(f) 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

(g) Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

(h) Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

(i) Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

(j) 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

(k) 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

(l) 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

K.S.Rangasamy College of Technology, Tiruchengode – 637 215								
Curriculum for the Programmes under Autonomous Scheme								
Regulation	R 2010							
Department	Department of Computer Science and Engineering							
Programme Code & Name	CS : B.E. Computer Science and Engineering							

Semester I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 EN 101	Technical English	3	0	0	3	50	50	100
10 MA 101	Engineering Mathematics I	3	1	0	4	50	50	100
10 PH 102	Physics of Materials (CS, EC, EE,EI,IT)	3	0	0	3	50	50	100
10 CH 101	Engineering Chemistry	3	0	0	3	50	50	100
10 GE 102	Engineering Graphics (BT, CS, EC, EE,EI,IT)	2	0	3	4	50	50	100
10 GE 104	Basics of Civil and Mechanical Engineering (CS, EC, EE,EI,IT)	4	0	0	3	50	50	100
	PRACTICAL							
10 CH 100	Engineering Chemistry Laboratory	0	0	3	2	50	50	100
10 GE 1P1	Engineering Practices Laboratory	0	0	3	2	50	50	100
Total		18	01	09	24	800		

Semester II								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 EN 102	Communication Skills	3	0	0	3	50	50	100
10 MA 102	Engineering Mathematics II	3	1	0	4	50	50	100
10 CH 102	Environmental Engineering	3	0	0	3	50	50	100
10 PH 101	Engineering Physics	3	0	0	3	50	50	100
10 GE 101	Fundamentals of Programming	3	1	0	3	50	50	100
10 GE 105	Basics of Engineering Mechanics (CS, EC, EE,EI,IT)	3	1	0	4	50	50	100
	PRACTICAL							
10 PH 100	Engineering Physics Laboratory	0	0	3	2	50	50	100
10 GE 1P2	Fundamentals of Programming Laboratory	0	0	3	2	50	50	100
Total		18	03	06	24	800		

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Semester III

Course Code	Course Name	L	T	P	C	CA	ES	Total
	THEORY							
10 MA 003	Engineering Mathematics III	3	1	0	4	50	50	100
10 EE 001	Basics of Electrical Engineering (CS, IT)	3	0	0	3	50	50	100
10 EC 002	Electronic Devices and Circuits (CS, IT)	3	0	0	3	50	50	100
10 EC 003	Digital Principles and System Design (CS, EC, IT)	3	0	0	3	50	50	100
10 CS 311	Object Oriented Programming and C++	3	0	0	3	50	50	100
10 CS 001	Data Structures Using C (CS, EE, EI, IT)	3	0	0	3	50	50	100
	PRACTICAL							
10 EC 0P1	Electronic Circuits and Digital Laboratory (CS, IT)	0	0	3	2	50	50	100
10 CS 3P1	Object Oriented Programming and C++ Laboratory	0	0	3	2	50	50	100
10 CS 0P1	Data Structures using C Laboratory (CS, EE, EI, IT)	0	0	3	2	50	50	100
10 TP 0P1	Career Competency Development I	0	0	2	0	100	00	100
Total		18	1	11	25		1000	

Semester IV

Course Code	Course Name	L	T	P	C	CA	ES	Total
	THEORY							
10 MA 006	Discrete Mathematics	3	1	0	4	50	50	100
10 CS 003	Design and Analysis of Algorithm (CS, IT)	3	0	0	3	50	50	100
10 EC 007	Microprocessors and Microcontrollers (CS, EC, IT)	3	0	0	3	50	50	100
10 CS 411	Computer Architecture	3	0	0	3	50	50	100
10 CS 412	Java Programming	3	0	0	3	50	50	100
10 CS 413	Operating Systems	3	0	0	3	50	50	100
	PRACTICAL							
10 EC 0P3	Microprocessors and Microcontrollers Laboratory (CS, EC, IT)	0	0	3	2	50	50	100
10 CS 4P1	Java Programming Laboratory	0	0	3	2	50	50	100
10 CS 4P2	Operating Systems Laboratory	0	0	3	2	50	50	100
10 TP 0P2	Career Competency Development II	0	0	2	0	100	00	100
Total		18	1	11	25		1000	

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Semester V

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 MA 008	Probability and Queuing Theory	3	1	0	4	50	50	100
10 CS 005	Database Management Systems (CS, IT)	3	1	0	4	50	50	100
10 CS 511	System Software	3	0	0	3	50	50	100
10 CS 512	Data Communication and Networks	3	0	0	3	50	50	100
10 CS 513	Web Technology	3	0	0	3	50	50	100
10 CS 514	Graphics and Multimedia System	3	0	0	3	50	50	100
	PRACTICAL							
10 CS 0P4	Database Management Systems Laboratory	0	0	3	2	50	50	100
10 CS 5P1	Web Technology Laboratory	0	0	3	2	50	50	100
10 CS 5P2	Graphics and Multimedia System Laboratory	0	0	3	2	50	50	100
10 TP 0P3	Career Competency Development III	0	0	2	0	100	00	100
Total		18	2	11	26	1000		

Semester VI

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 HS 001	Professional Ethics	3	0	0	3	50	50	100
10 CS 611	Object Oriented Analysis and Design	3	1	0	4	50	50	100
10 CS 612	C # and .Net Frame Work	3	1	0	4	50	50	100
10 CS 613	Visual Programming	3	0	0	3	50	50	100
10 CS 614	Software Engineering	3	0	0	3	50	50	100
10 CS E1*	Elective I	3	0	0	3	50	50	100
	PRACTICAL							
10 CS 6P1	Visual Programming Laboratory	0	0	3	2	50	50	100
10 CS 6P2	C # and .Net Laboratory	0	0	3	2	50	50	100
10 CS 6P3	Case Tools Laboratory	0	0	3	2	50	50	100
10 TP 0P4	Career Competency Development IV	0	0	2	0	100	00	100
Total		18	2	11	26	1000		

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Semester VII							

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 HS 002	Total Quality Management	3	0	0	3	50	50	100
10 IT 001	Mobile Computing (CS, IT)	3	0	0	3	50	50	100
10 CS 711	Open Source System	3	1	0	4	50	50	100
10 CS 712	Cryptography and Network Security	3	0	0	3	50	50	100
10 CS 713	Principles of Compiler Design	3	1	0	4	50	50	100
10 CS E2*	Elective II	3	0	0	3	50	50	100
	PRACTICAL							
10 CS 7P1	Compiler Design Laboratory	0	0	3	2	50	50	100
10 CS 7P2	Open Source System Laboratory	0	0	3	2	50	50	100
10 CS 7P3	Project Work - Phase I	0	0	4	2	100	00	100
10 TP 0P5	Career Competency Development V	0	0	2	0	100	00	100
Total		18	2	12	26	1000		

Semester VIII							
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 HS 003	Principles of Management	3	0	0	3	50	50	100
10 CS 811	Software Testing	3	0	0	3	50	50	100
10 CS E3*	Elective III	3	0	0	3	50	50	100
10 CS E4*	Elective IV	3	0	0	3	50	50	100
	PRACTICAL							
10 CS 8P1	Project Work - Phase II	0	0	16	8	50	50	100
Total		12	0	16	20	500		

CS: B.E COMPUTER SCIENCE AND ENGINEERING-REGULATION 2010 -SYLLABUS

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Curriculum for the Programmes under Autonomous Scheme								
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Programme Code & Name	CS : B.E. Computer Science and Engineering							
Elective I								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
	THEORY							
10 CS E11	Data Mining	3	0	0	3	50	50	100
10 CS E12	Advanced Computer Architecture	3	0	0	3	50	50	100
10 CS E13	User Interface Design	3	0	0	3	50	50	100
10 CS E14	Pattern Recognition Techniques	3	0	0	3	50	50	100
10 CS E15	Information Storage and Management	3	0	0	3	50	50	100
10 CS E16	Distributed Computing	3	0	0	3	50	50	100
Elective II								
10 IT E21	Cloud Computing (CS, IT)	3	0	0	3	50	50	100
10 CS E21	XML and Web Services	3	0	0	3	50	50	100
10 CS E22	Embedded System Design	3	0	0	3	50	50	100
10 CS E23	Multimedia Computing	3	0	0	3	50	50	100
10 CS E24	Mobile Ad-hoc Networks	3	0	0	3	50	50	100
10 CS E25	Software Forensics	3	0	0	3	50	50	100
Elective III								
10 CS E31	Decision Support Systems and Intelligent Systems	3	0	0	3	50	50	100
10 CS E32	Artificial Intelligence	3	0	0	3	50	50	100
10 CS E33	Object Oriented Programming in Python	3	0	0	3	50	50	100
10 CS E34	Trust Computing	3	0	0	3	50	50	100
10 CS E35	Security Issues in Ad-hoc Networks	3	0	0	3	50	50	100
10 CS E36	Service Oriented Architecture	3	0	0	3	50	50	100
Elective IV								
10 CS E41	Parallel Computing	3	0	0	3	50	50	100
10 CS E42	Text Mining	3	0	0	3	50	50	100
10 CS E43	Semantic Web	3	0	0	3	50	50	100
10 CS E44	Agile Software Methodology	3	0	0	3	50	50	100
10 CS E45	Software Quality Assurance	3	0	0	3	50	50	100
10 CS E46	Wireless Sensor Networks	3	0	0	3	50	50	100

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Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 HS 002	TOTAL QUALITY MANAGEMENT	3	0	0	3	50	50	100

Objective(s)	Understanding the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management, Understanding the statistical approach for quality control, creating awareness about the ISO and QS certification process and its need for the industries.

1	INTRODUCTION	Total Hrs	9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Quality Council, Quality Statements, Deming Philosophy, Barriers to TQM Implementation.

2	TQM PRINCIPLES	Total Hrs	9

Customer satisfaction, Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement, Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership, Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures-Basic Concepts, Strategy.

3	STATISTICAL PROCESS CONTROL (SPC)	Total Hrs	9

The tools of quality, Statistical Fundamentals, Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New Management tools.

4	TQM TOOLS	Total Hrs	9

Benchmarking, Reasons to Benchmark, Benchmarking Process, Quality Circle, Quality Function Deployment (QFD). House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), Concept, Improvement Needs, FMEA–Stages, Types.

5	QUALITY SYSTEMS	Total Hrs	9

Need for ISO 9000 Quality Systems, ISO 9001:2008 ISO 14000 Quality Systems, Elements Concepts, Implementation, Documentation, Quality Auditing, Requirements and Benefits, Non Conformance report, Case Studies on Educational System.

Total hours to be taught	45

Text book (s) :	
1	Dale H.Besterfiled, et al., "Total Quality Management", Pearson Education Asia, 1999. (Indian reprint 2002).

Reference(s) :	
1	James R.Evans & William M.Lidsay, "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002.
2	Feigenbaum.A.V. "Total Quality Management", McGraw Hill, 1991.
3	Jayakumar.V, Total Quality Management", Lakshmi Publications, 2006.
4	Suburaj, Ramasamy "Total Quality Management", Tata McGraw Hill, 2005.

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Semester VII								
Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 IT 001	MOBILE COMPUTING (CS, IT)	3	0	0	3	50	50	100

Objective(s)	To learn the basics of Wireless voice and data communications technologies. To build working knowledge on various telephone and satellite networks. To study the working principles of wireless LAN and its standards. To build knowledge on various Mobile Computing Algorithms. To build skills in working with Wireless Application Protocols to develop mobile content applications.

1	WIRELESS COMMUNICATION FUNDAMENTALS	Total Hrs	9

Introduction – Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation – Multiplexing – Modulations – Spread spectrum – MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks

2	TELECOMMUNICATION NETWORKS	Total Hrs	11

Telecommunication systems – GSM – GPRS – DECT – UMTS – IMT-2000 –Satellite Systems - Broadcast Systems – DAB - DVB.

3	WIRELESS LAN	Total Hrs	9

Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer – IEEE 802.11a - 802.11b standards – HIPERLAN – Blue Tooth.

4	MOBILE NETWORK LAYER	Total Hrs	9

Mobile IP – Dynamic Host Configuration Protocol - Routing – DSDV – DSR –Least Interference Routing-Hierarchical-Geographic Position Assisted Ad Hoc Routing .

5	TRANSPORT AND APPLICATION LAYERS	Total Hrs	7

Traditional TCP – Classical TCP improvements – WAP- Case study – Android

Total hours to be taught	45

Text book (s) :	
1	Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition, 2008.

Reference(s):	
1	William Stallings, "Wireless Communications and Networks", PHI/Pearson Education, 2002.
2	Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.
3	Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
4	Hazysztof Wesolowshi, "Mobile Communication Systems", John Wiley and Sons Ltd, 2002.

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Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 711	OPEN SOURCE SYSTEM	3	1	0	4	50	50	100

Objective(s)	Gaining Knowledge in the concept of Open Source System, Open Source Operating System, Open Source Database: MYSQL and PHP.

1	INTRODUCTION	Total Hrs	12

Introduction to Open sources- Need of Open Sources – Advantages of Open Sources- Application of Open Sources.

2	OPEN SOURCE OPERATING SYSTEM	Total Hrs	12

Open Source Operating system: LINUX: Introduction – General Overview –The Linux Shell and File structure: The shell – The shell scripts and programming – Shell configuration – Linux files ,Directories and Archives

3	OPEN SOURCE DATABASE: MYSQL	Total Hrs	12

MySQL: Introduction – Setting up account – Starting, terminating and writing your own SQL programs – Record selection Technology – Working with strings – Date and Time– Sorting Query Results – Generating Summary- Using sequences

4	BASICS OF PHP	Total Hrs	12

PHP: Introduction – variables- constants –data types – operators – Statements – Functions.

5	OBJECT ORIENTED CONCEPT OF PHP	Total Hrs	12

OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP Connectivity

Total hours to be taught	60

Reference(s):	
1	"The Complete Reference Linux", Sixth Edition 2010 by Richard Petersen, Tata McGraw Hill Edition
2	Paul Dubois, "MySQL cook book", O'reilly publication, October 2002.
3	Steven Holzner, "PHP: The Complete Reference", 2nd Edition, Tata McGraw-Hill Publishing Company Limited, Indian Reprint 2009.
4	http://opensource.org/osd
5	Rasmus Lerdorf and Levin Tatroe, "Programming PHP", O'Reilly, 2002
6	Vikram Vaswani, "MYSQL: The Complete Reference", 2nd Edition, Tata McGraw- Hill Publishing Company Limited, Indian Reprint 2009.

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Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 712	CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3	50	50	100

Objective(s)	Knowing the methods of conventional encryption, understanding the concepts of public key encryption and number theory , understanding authentication and Hash functions, knowing the network security tools and applications and understanding the system level security used.

1	INTRODUCTION	Total Hrs	10

OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES.

2	PUBLIC KEY CRYPTOGRAPHY	Total Hrs	10

Key Management - Diffie-Hellman key Exchange – Elliptic Curve Arithmetic and Cryptography - Introduction to Number Theory – Traffic Confidentiality – Key Distribution - Public Key Cryptography and RSA.

3	AUTHENTICATION AND HASH FUNCTION	Total Hrs	9

Authentication requirements – Authentication functions – Message Authentication Codes – Cryptographic Hash Functions - Secure Hash Algorithm – MAC based on Hash function: HMAC - Digital Signatures – Digital Signature Standard

4	NETWORK SECURITY	Total Hrs	8

Kerberos – X.509 Certificates – Electronic Mail Security – Pretty Good Privacy – S/MIME - IP Security – Transport Level Security - Web Security Considerations – Secure Socket Layer and Transport layer Security - Transport layer Security.

5	SYSTEM LEVEL SECURITY	Total Hrs	8

Intruders - Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Distributed Denial of service attacks – Firewalls – Types – Firewall Location and Configurations.

Total hours to be taught	45

Text book (s) :	
1	William Stallings, "Cryptography And Network Security – Principles and Practices", Prentice Hall of India, Fifth Edition, 2012.

Reference(s):	
1	Behrouz A. Forouzen, Dabdeep Mukhopadhya, "Cryptography and Network Security", Tata McGraw-Hill, 201
2	Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, Second Edition, 2008.
3	V.K.Pachghare, "Cryptography and Information Security", PHI Publications, 2011.
4	William Stallings, "Cryptography And Network Security – Principles and Practices", Prentice Hall of Ind Fourth Edition, 2008.

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Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 713	PRINCIPLES OF COMPILER DESIGN	3	1	0	4	50	50	100

Objective(s)	Enable the students to learn the phases of the compilation process. Develop an awareness of the function, design of a languages and grammars for modern compilers. Exercise the execution of lexical analysis, parsing techniques, intermediate code generation, run time environment, code optimization and code generation that helps to understand the importance of appropriate techniques.

1	COMPILER AND LEXICAL ANALYSIS	Total Hrs	12

Introduction to Compilers – Structure of a Compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – Regular Expressions to Automata.

2	SYNTAX ANALYSIS	Total Hrs	12

Role of the Parser – Context-Free Grammars – Writing a Grammars – Top Down Parsing – Recursive Descent Parsing – Predictive Parsing – Bottom-up Parsing – Shift Reduce Parsing – LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

3	INTERMEDIATE CODE GENERATION	Total Hrs	12

Intermediate languages – Three-Address Code – Types and Declarations – Translation of Expressions – Rules for Type Checking and Type Conversions – Control Flow – Backpatching – Switch Statements – Procedures.

4	CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS	Total Hrs	12

Code Optimization – Principal Sources of Optimization – Introduction to Data Flow Analysis – Run Time Environments – Storage Organization – Stack Allocation of Space – Access to Non-Local Data on the Stack.

5	CODE GENERATION	Total Hrs	12

Issues in the Design of a Code Generator – Target Language – Addresses in the Target Code – Basic Blocks and Flow Graphs – Optimization of Basic Blocks – A Simple Code Generator – Peephole Optimization.

Total hours to be taught	60

Text book (s) :

1.	Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers Principles, Techniques and Tools", Second Edition, Pearson Education, 2011.

Reference(s):

1.	Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2003.
2.	C. N. Fischer and R. J. LeBlanc, "Crafting a Compiler with C", Benjamin Cummings, 2003.
3.	J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill, 2003.
4.	Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5.	Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003.

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Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 7P1	COMPILER DESIGN LABORATORY	0	0	3	2	50	50	100
Objective(s)	Enable the students to learn conversion of high level to machine code. Understanding the design and implementation of different phases of a compiler.							
List of Experiments								

1. Lexical analyzer

2. Syntax analyzer

3. Validate string for the given regular expression

4. NFA using regular expression

5. Top down parsing

6. Shift reduce parsing

7. Simple LR parsing

8. Three address Code generator

9. Code optimization

10. DAG creation

Total hours to be taught	45

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Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 7P2	OPEN SOURCE SYSTEM LABORATORY	0	0	3	2	50	50	100
Objective(s)	Providing knowledge in Open Source Programming. Understanding the concepts of Linux, MYSQL, and PHP.							

List of experiments

1. Write and Execute essential Shell Scripting Commands in Linux and write a Script to print user information who currently login with current date & time.

2. Connecting the MYSQL database and perform the following
   a. Creating and Deleting Database.
   b. Creating a Table.
   c. Examining the Results.
   d. Inserting / Retrieving Data into / from Tables.
3.
   a. Selecting Specific Rows and Columns.
   b. Deleting and Updating Rows.
   c. Loading a Database from a File.

4. PHP program that displays a welcome message

5. PHP program to implement Simple data storage, operators and Functions.

6. PHP script implements string handling functions.

7. PHP program to compare the strings "apple", "orange", "banana" between them and displays the comparison result.

8. PHP Script that implements the database connectivity.

9. PHP scripts that implement the following file handling operations
   i. Reading data from the file
   ii. Writing data to the file
   iii. Printing all the records.

10. Write a PHP script to add the Rollno, name, six subjects' marks into Mark table in MySQL and display the average and result.

Total hours to be taught	45

K.S.Rangasamy College of Technology - Autonomous Regulation		R 2010

Department	Computer Science and Engineering	Programme Code & Name	CS : B.E. Computer Science and Engineering

Semester VII

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 7P3	PROJECT WORK – PHASE I	0	0	4	2	100	00	100

Objective(s)	Imparting the practical knowledge to the students and also to make them to carry out the technical procedures in their project work. To provide an exposure to the students to refer, read and review the research articles, journals and conference proceedings rele4vant to their project work and placing this as their beginning stage for their final presentation.
Methodology	Three reviews have to be conducted by the committee of minimum of three members one of which should be the guide Problem should be selected Students have to collect about 20 papers related to their work Reports has to be prepared by the students as per the format in Annexure – 1 Preliminary implementation can be done if possible Internal evaluation has to be done for 100 Marks

Total hours	60

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Department	Computer Science and Engineering	Programme Code & Name			CS:B.E. Computer Science and Engineering		

Semester VII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 TP 0P5	Career Competency Development V	0	0	2	0	100	00	100

Objective(s)	To enhance employability skills and to develop career competency

Unit – 1	Written and Oral Communication	Hrs
Self Introduction – GD – HR Interview Skills – Corporate Profile Review Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual		6
Unit – 2	Verbal & Logical Reasoning	
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual		6
Unit – 3	Quantitative Aptitude	
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual		6
Unit – 4	Data Interpretation and Analysis	
Practices on Company Based Questions and Competitive Exams Materials: Instructor Manual		6
Unit – 5	Programming & Technical Skills – Part 3	
Data Structure - Arrays – Linked List – Stack – Queues – Tree – Graph Practices on Algorithms and Objective Type Questions Materials: Instructor Manual		6
	Total	30

Evaluation Criteria

S.No.	Particular	Test Portion	Marks
1	Evaluation 1 Written Test	15 Questions each from Unit 1, 2,3, 4 & 5 (External Evaluation)	60
2	Evaluation 2 - Oral Communication	GD and HR Interview (External Evaluation by English, MBA Dept.)	20
3	Evaluation 3 – Technical Interview	Internal Evaluation by the Dept. – 3 Core Subjects	20
		Total	100

Reference Books
1. Aggarwal, R.S. "A Modern Approach to Verbal and Non-verbal Reasoning", Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2. Abhijit Guha, "Quantitative Aptitude", TMH, 3rd edition
3. Objective Instant Arithmetic by M.B. Lal & GoswamiUpkar Publications.
4. Word Power Made Easy by Norman Lewis W.R. GOYAL PUBlications

Note:
• Instructor can cover the syllabus by Class room activities and Assignments(5 Assignments/week)
• Instructor Manual has Class work questions, Assignment questions and Rough work pages
• Each Assignment has 20 questions for Unit 1,2,3,4 & 5 and Unit 5 and 5 questions from Unit 5(Algorithms) & Unit 1(Oral Communication)
• Evaluation has to be conducted as like Lab Examination.

VII Semester - Course Outcomes

Modules	10 HS 002– Total Quality Management Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Elucidate the Concept of quality and Dimensions of quality, Planning and quality costs analysis Techniques
2	Comprehend the Basic Concept, Principles of TQM and Barriers to TQM Implementation
3	Discuss the Concepts of Customer satisfaction, Perception, Complaints, Service Quality and Retention
4	Implement the Performance Appraisal and Benefits
5	Gain knowledge in the Measures of central Tendency and Dispersion
6	Implement the Control Charts for variables and attributes and new management tools
7	Analyze the concept of Benchmarking, Process, Reasons to Benchmark
8	Gain the knowledge of Total Productive Maintenance, Improvement Needs and Stages of FMEA
9	Narrate the concept of Quality Systems, elements, implementation and documentation
10	Comprehend the Basic Concept of quality Auditing, Requirements, Benefits and Non conformance report

Modules	10 IT 001 - Mobile Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Gain Knowledge in basics of radio transmission.
2	Identify the reason for need of special MAC in wireless network.
3	Describe second generation digital cellular network and its architecture.
4	Recognize the role of unidirectional broadcast systems within mobile communication scenario.
5	Observe various WLAN products , its system and protocol architecture
6	Examine the basics and various phases of HIPERLAN 1and bluetooth
7	Identify the requirements of Mobile IP for Ipv4 and Ipv6.
8	Gain knowledge on various types of routing protocols.
9	Acquire the knowledge of TCP for mobility
10	Obtain the knowledge of WAP and its components and architecture

Modules	10 CS 711 - Open Source System Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Understand the basic concepts of Open source
2	Identify the applications of Open source
3	Describe the Linux file structure and shell structure.
4	Understand the shell scripts and programming
5	Expressthe fundamental knowledge about MySql database
6	Discuss the MySql record selection technology and administration.
7	Describe the basic terminologies of PHP
8	Extend the knowledge of operators and functions of PHP
9	Apply the knowledge of object oriented concepts in PHP
10	Apply the knowledge about the PHP and SQL database connectivity

Modules	10 CS 712 - Cryptography and Network Security Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Understand the OSI (open system interconnection) architecture framework for defining security attacks and various data encryption standards.
2	Realize the knowledge about Block Cipher design principles, Advanced Encryption Standard, and reliable transfer of keys between two users.
3	Recognize with Elliptic curve architecture which helps to learn the drawbacks over RSA algorithm.
4	Analyze the knowledge about the confidentiality factors and symmetric encryption techniques.
5	Realize the study of ensuring the right user from accessing a particular system and to discover about a function that used to produce an authenticator.
6	Know the authentication and confidentiality hash function and to expel the third party penetration in a mail transfer between two parties
7	Realize the authentication application and about Electronic mail security
8	Understand about the various IP security and Web security principles
9	Identify the behaviors of intruders, authorized users and principles of password management
10	Identify various kinds of virus and threats and learn about the firewall principles and techniques

Modules	10 CS 713 - Principles of Compiler Design
	Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Recognize the various phases of compiler and its functions
2	Examine the grammar for the generated tokens and solving finite automata for a input string
3	Solve the left and right most derivation
4	Comprehend the top down parsing techniques
5	Infer the processing of bottom up parsing
6	Examine about the intermediate code representation
7	Interpret the concept of statement and expression
8	Analyze the function preserving and structure preserving transformation
9	Summarize about various storage strategies, basic blocks and flow graphs
10	Investigate the issues in the design of code generator and target machine

Modules	10 CS 7P1 - Compiler Design Laboratory
	Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Review the concept of lexical analyzer to tokenize the given input program
2	Interpret the syntax of any programming language using syntax analyzer
3	Determine whether the string for the given regular expression is valid or not
4	Design a finite automata to compute a NFA using regular expression
5	Implement the top down parser for the given grammar
6	Execute the shift reduce parser
7	Implement a simple LR parsing algorithm
8	Develop the three address code for intermediate representation
9	Execute a code optimization for intermediate representation
10	Examine the DAG creation for postfix expression

Modules	10 CS 7P2 - Open Source System Laboratory Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Demonstrate the concept of shell scripting concepts in linux
2	Interpret the concepts of MySql
3	Experiment the Record selection technology in MySql
4	Demonstrate the basic concept in PHP
5	Develop the simple PHP application using operators and Functions.
6	Demonstrate the string handling functions in PHP
7	Compare the strings between them and displays the comparison result
8	Demonstrate the MySql database connectivity in PHP
9	Express the concepts of file handling functions in PHP
10	Create a webpage using PHP.

Modules	10 CS 7P3 - Project Work - Phase I Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Identify a problem in the domain of interest
2	Perform literature survey and identify the existing issues
3	Identify the possible solutions
4	Identify tools and techniques to implement the project
5	Prepare technical report

Modules	10 TP 0P5- Career Competency Development V Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Predict and analyse the aptitude and logical skills
2	Review their verbal ability and written ability
3	Assess their capabilities among the team members
4	Prepare for an interview process
5	Identify the key elements of decision-making in the context of career planning

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Semester VIII

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 HS 003	PRINCIPLES OF MANAGEMENT	3	0	0	3	50	50	100

Objective(s)	Improving the Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge in international aspect of management.

1.	HISTORICAL DEVELOPMENT	Total Hrs	9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2.	PLANNING	Total Hrs	9

Nature & Purpose – Types of Plans – Steps involved in Planning – Objectives – Setting Objectives – process of Management by Objectives – Strategies, Policies & Planning Premises – Forecasting – Decision making.

3.	ORGANISING	Total Hrs	9

Nature and purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and limitations – De-Centralization and Delegation of Authority – Staffing – Selection process – Techniques – HRD – Managerial Effectiveness.

4.	DIRECTING	Total Hrs	9

Scope – Human Factors – Leadership – Types of Leadership – Motivation – Hierarchy of needs – Motivation Theories – Motivational Techniques – Job Enrichment – Communication – process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

5.	CONTROLLING	Total Hrs	9

System and process of Controlling – Requirements for effective control – the Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

Total hours to be taught	45

Text book (s):

1.	Harold Kooritz & Heinz Weihrich, "Essentials of Management", Tata McGraw-Hill, 1998.
2.	Joseph L Massie, "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

Reference(s):

1.	Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.
2.	Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996.
3.	JAF Stomer, Freeman R. E and Daniel R "Gilbert Management", Pearson Education, Sixth Edition, 2004.
4.	Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.
5.	Prasad L.M, "Principles of Management", Sultan Chand & Sons Ltd, 2003.

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Semester VIII

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 811	SOFTWARE TESTING	3	0	0	3	50	50	100

Objective(s)	To explain the basics of software testing. To highlight the strategies for software testing. To stress the need and conduct of testing levels. To identify the issues in testing management. To bring out the ways and means of controlling and monitoring testing activity

1	INTRODUCTION TO TESTING	Total Hrs	8

Software Testing – Definition of Software Testing – Objective and limits of testing – Testing Strategy – Roles and Responsibilities of a Software Tester in Organizations – Independent Verification and Validation

2	SOFTWARE TESTING REQUIREMENTS	Total Hrs	10

Software Testing Requirements - Analyzing the requirements -Classifying the Functional and Non Functional Requirements. Software Testing Review Process - Objective of Software Testing Review - Types of Reviews - Peer Review, Walkthrough, Inspection - Checklists of Review Process - Review Log

3	TESTING TECHNIQUES	Total Hrs	9

White box testing techniques – Static and Dynamic Testing – Statement Coverage – Decision Coverage – Basic Path Testing – Control Flow Graph Coverage – Branch Coverage – Conditional Coverage – McCabe's Cyclomatic Complexity – Mutation Testing. Black Box Test Techniques – Boundary Value Analysis – Equivalent Class Partition – Error Guessing – Decision Table – State Transition Table – Pair Wise Testing – Use Case Testing.

4	TESTING TYPES	Total Hrs	9

Unit Testing, Smoke Testing, Functional Testing and its types – Integration, System Testing, User Acceptance Testing (Alpha & Beta)- Non Functional Testing and its types – Performance Testing (Load, Volume, Stress) – Recovery Testing, Browser Compatibility Testing – Security Testing – Scalability Testing – Usability Testing – Ad Hoc Testing – Internationalization Testing – Configuration Testing - DataWare House Testing and Business Intelligence Testing – Mobile Testing

5	TEST CASE DESIGN	Total Hrs	9

Definition of Test Case - Standard, Guidelines and Naming Conventions for Test Case Design – Characteristics of Good Test Cases and its templates – Creation of Test Case – Requirement Coverage –Traceability Matrix – Test Case Review Process – Test Execution – Test Log - Reporting of Test Execution – Risk Based Testing Approach – Definition of Risk - Importance of RBT – Classifying the Test Cases using RBT approach

Total hours to be taught	45

Text book :	
1	S.Subashni, N.Sathees Kumar, Dr.B.G.Geetha, Dr.G.Singaravel, "Software Testing", Umayam Publications , 1st edition ,2013.

Reference (s) :	
1	Marnie L.Hutchson, "Software Testing Fundamentals Methods and Metrics",Wiley,2003 edition
2	Glenford J.Myess,"The Art of testing", Wiley, 2003 edition.
3	Mauro pezze,Michal young, "Software Testing and Analysis: Process, Principles, and Techniques",Wiley,2008 edition
4	Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, New Delhi, 1995
5	Elfriede Dustin, "Effective Software Testing", Pearson Education, New Delhi, 2003
6	Renu Rajani and Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw-Hill, New Delhi, 2003

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Semester VIII							

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS 8P1	PROJECT WORK – PHASE II	0	0	16	8	50	50	100

Objective(s)	Enabling and strengthening the students to carry out the project on their own and to implement their innovative ideas to forefront the risk issues and to retrieve the hazards by adopting suitable assessment methodologies and stating it to global.
Methodology	Three reviews have to be conducted by the committee of minimum of three members one of which should be the guide Each review has to be evaluated for 100 Marks Attendance is compulsory for all reviews. If a student fails to attend review for some valid reason, one or more chance may be given They should publish the paper preferably in the journals / conference Final review will be done by the committee that consists of minimum of three members one of which should be the guide (If possible include one external expert examiner with in the college) The Report should be submitted by the students around at the end of April.

Total hours	240

VIII Semester Course Outcome

	10 HS 003 - Principles of Management Course Outcomes (COs)
Modules	**At the end of the course, the student will be able to**
1	Explore the basic concepts of management, and to learn the contributions and functions, types of business organization.
2	Gain knowledge about the various types of planning, setting objectives and forecasting.
3	Distinguish formal and informal organization, and gain knowledge on various types of organization chart, its structure and process.
4	Analyze comparatively the selection process and leadership.
5	Gain the knowledge on the various types of leadership.
6	Evaluate the motivation theories and motivational techniques.
7	Explore the importance of communication, process, barriers, breakdown of communication and importance of electronic media in communication.
8	Identify the different processes of controlling and concept budgeting.
9	Make a good productivity.
10	Comprehend the global environment, Gaining knowledge about the international management and global theory of management.

	10 CS 811 - Software Testing Course Outcomes (COs)
Modules	**At the end of the course, the student will be able to**
1	Know the basic concepts of software testing
2	Justify about computer based system, verification & validation
3	Analyze the functional requirements of the system
4	Interpret the use of conducting the review
5	Implement internal and external views of software testing
6	Determine the need for White box, Basis path, Black box and Control structure testing
7	Classify different strategic approaches and types in software testing
8	Describe the concepts of data warehouse testing and Mobile testing
9	Implement the guidelines to generate test cases
10	Explore about Risk Based Testing Approach in test cases

	10 CS 8P1 - Project Work - Phase II Course Outcomes (COs)
Modules	**At the end of the course, the student will be able to**
1	Design modules of the project.
2	Integrate the modules and arrive the final output.
3	Investigate the results with available solutions.
4	Demonstrate the outcome of the project and verify.
5	Prepare technical report

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Elective I							

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E11	DATA MINING	3	0	0	3	50	50	100

Objective(s)	This subject introduces basic concepts, tasks, methods, and techniques in data mining. The emphasis is on various data mining problems and their solutions. Students will develop an understanding of the data mining process and issues, learn various techniques for data mining, and apply the techniques in solving data mining problems using data mining tools and systems.

1	INTRODUCTION TO DATA MINING	Total Hrs	9

Motivation and importance - What is Data Mining - Relational Databases - Data Warehouses - Transactional Databases - Advanced Database Systems - Data Mining Functionalities - Interestingness of a pattern Classification of Data Mining Systems - Major issues in Data Mining.

2	DATA WAREHOUSE AND OLAP TECHNOLOGY FOR DATA MINING	Total Hrs	9

What is a Data Warehouse - Multi-Dimensional Data Model - Data Warehouse Architecture – Data Warehouse Implementation - Development of Data Cube Technology - Data Warehousing to Data Mining.

3	DATA PREPROCESSING	Total Hrs	9

Why Pre-process the Data? - Data Cleaning - Data Integration and Transformation Data Reduction - Discretization and Concept Hierachy Generation - Data Mining Primitives: Mining Association rule in large Databases - Association Rule Mining - Mining Single-dimensional Boolean Association rules from Transactional Databases - Mining Multi-dimensional Association rules from relational databases & Data Warehouses.

4	CLASSIFICATION AND PREDICTION	Total Hrs	9

Concepts and Issues regarding Classification and Prediction - Classification by Decision Tree Induction – Bayesian Classification - Classification by Back-propagation - Classification Based on Concepts from Association Rule Mining.

5	CLUSTER ANALYSIS	Total Hrs	9

What is Cluster Analysis? - Types of Data in Cluster Analysis - A Categorization of Major clustering methods - partitioning methods - Hierarchial methods - Density-Based Methods: DBSCAN - Grid-based Method: STING - Model-based Clustering Method: Statistical approach - Outlier analysis

Total hours to be taught	45

Text book (s) :	
1	Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Morgan Kaufman Publications.

Reference(s):	
1	Adriaan, "Introduction to Data Mining", Addison Wesley Publication
2	A.K.Pujari, "Data Mining Techniques", University Press

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Elective I								

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E12	ADVANCED COMPUTER ARCHITECTURE	3	0	0	3	50	50	100
Objective(s)	Studying the ISA design, instruction pipelining and performance related issues, doing a detailed study of ILP with dynamic Approaches, doing a detailed study of ILP with software approaches, studying the different multiprocessor architectures and related issues, studying the Memory and I/O systems and their performance issues.							

1	INTRODUCTION	Total Hrs	9

Fundamentals of Computer Design – Measuring and reporting performance – Quantitative principles of computer design. Instruction set principles – Classifying ISA – Design issues. Pipelining – Basic concepts – Hazards – Implementation – Multicycle operations.

2	INSTRUCTION LEVEL PARALLELISM WITH DYNAMIC APPROACHES	Total Hrs	9

Concepts – Dynamic Scheduling – Dynamic hardware prediction – Multiple issues – Hardware based speculation – Limitations of ILP.

3	INSTRUCTION LEVEL PARALLELISM WITH SOFTWARE APPROACHES	Total Hrs	9

Compiler techniques for exposing ILP – Static branch prediction – VLIW – Advanced compiler support – Hardware support for exposing more parallelism – Hardware versus software speculation mechanisms.

4	MEMORY AND I/O	Total Hrs	9

Cache performance – Reducing cache miss penalty and miss rate – Reducing hit time – Main memory and performance – Memory technology. Types of storage devices – Buses – RAID – Reliability, availability and dependability – I/O performance measures – Designing an I/O system.

5	MULTIPROCESSORS AND THREAD LEVEL PARALLELISM	Total Hrs	9

Symmetric and distributed shared memory architectures – Performance issues – Synchronization – Models of memory consistency – Multithreading.

Total hours to be taught	45

Text book (s) :

1	John L. Hennessey and David A. Patterson,"Computer Architecture: A Quantitative Approach", Morgan Kaufmann, 2003, Third Edition.

Reference(s):

1	D.Sima, T.Fountain and P.Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.
2	Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi, 2003

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Elective I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E13	USER INTERFACE DESIGN	3	0	0	3	50	50	100

Objective(s)	Studying the concept of menus, windows, interfaces, about business functions, characteristics and components of windows, various controls for the windows, various problems in windows design with color, text, graphics and testing methods

1	HUMAN COMPUTER INTERFACE	Total Hrs	9

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles.

2	USER INTERFACE DESIGN PROCESS	Total Hrs	9

User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings-Human consideration in screen design.

3	DESIGNING OF MENUS AND WINDOWS	Total Hrs	9

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

4	DESIGNING OF CONTROLS	Total Hrs	9

Device-based controls: characteristics-selecting the proper device based controls. Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

5	DESIGNING OF WEB PAGES	Total Hrs	9

Text for web pages - effective feedback-guidance & assistance-Internationalization-accesssibility-Icons-Image-Multimedia -coloring. Windows layout-test: prototypes - kinds of tests – retest. Usability of Web Sites and Case Study of e-commerce sites.

Total hours to be taught	45

Text book (s) :

1	Wilbert. O. Galitz, "The Essential Guide to User Interface Design", John Wiley& Sons, 2001.

Reference(s):

1	Ben Sheiderman, "Design the User Interface", Pearson Education, 1998.
2	Jacob Nielsen, "Usability Engineering ", Academic Press, 1993.
3	Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd., 2002.

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Elective I

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E14	PATTERN RECOGNITION TECHNIQUES	3	0	0	3	50	50	100
Objective(s)	Learning the basics of Pattern Classifier, learning Feature extraction, Classification and Recognition techniques, learning recent advances in pattern classification.							

1	PATTERN RECOGNITION OVERVIEW	Total Hrs	9

Pattern recognition, Classification and Description—Patterns and feature Extraction with Examples—Training and Learning in PR systems—Pattern recognition Approaches

2	STATISTICAL PATTERN RECOGNITION	Total Hrs	9

Introduction to statistical Pattern Recognition—supervised Learning using Parametric and Non Parametric Approaches

3	DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING	Total Hrs	9

Introduction—Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers -- Formulation of Unsupervised Learning Problems—Clustering for unsupervised learning and classification

4	SYNTACTIC PATTERN RECOGNITION	Total Hrs	9

Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference

5	NEURAL PATTERN RECOGNITION	Total Hrs	9

Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

Total hours to be taught	45

Text book (s) :	
1	Robert Schalkoff, "pattern Recognition: statistical, structural and neural approaches, John wiley & sons, Inc, 1992.

Reference(s) :	
1	Earl Gose, Richard johnsonbaugh, Steve Jost, Pattern Recognition and Image Analysis, Prentice Hall of India,.Pvt Ltd, new Delhi.
2	R.O.Duda, P.E.Hart & D.G Stork, Pattern Classification 2nd Edition, J.Wiley Inc 2001.

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Elective I

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E15	INFORMATION STORAGE AND MANAGEMENT	3	0	0	3	50	50	100
Objective(s)	Evaluating storage architecture; understand logical and physical components of a storage infrastructure including storage subsystems, describing storage networking technologies such as FC – SAN, NAS, IP – SAN and data archival solution – CAS, identifying difference storage virtualization technologies and their benefits, understanding business continuity solutions including, backup and recovery technologies, and Local and remote replication solutions.							

1	STORAGE SYSTEMS		Total Hrs	9

Introduction to Information Storage and Management: Information storage – Evolution of storage technology and architecture – Data center Infrastructure - Key challenges in managing information – Information life cycle.
Storage System Environment: Components of a the Host. RAID – implementation of RAID – RAID array components – RAID levels – RAID Comparison - Host spares. Intelligent storage System – Components – intelligent storage array.

2	STORAGE NETWORKING TECHNOLOGIES		Total Hrs	9

Direct – Attached storage and introduction to SCSI: Type of DAS – DAS benefits and limitations Disk Drive Interfaces – Introduction to Parallel SCSI – SCSI command model.
Storage Area Networks – Fiber channel – SAN evolution - SAN components – FC Connectivity – Fiber channel ports – Fiber Channel Architecture - Zoning – Fiber Channel login types – FC Topologies. Benefits of NAS – NAS file I/O – Components of NAS – NAS implementation – NAS file sharing protocols – NAS I/O operations.

3	ADVANCED STORAGE NETWORKING AND VIRTUALIZATION		Total Hrs	9

iSCSI – FCIP – Fixed content and archives – Types of archives – features and benefits of CAS – CAS architecture – Objects storage and retrieval in CAS – CAS Examples
Storage Virtualization: Forms of Virtualization - SNIA Storage virtualization taxonomy – storage virtualization configurations – storage virtualization challenges – Types of storage virtualization

4	BUSINESS CONTINUITY		Total Hrs	9

Introduction to Business continuity: Information availability – BC terminology – BC planning life cycle – Failure analysis – Business impact analysis – BC technology solutions – concept in practice
Backup and Recovery: Backup purpose – considerations – granularity – recovery considerations – backup technologies – concepts in practice

5	REPLICATION		Total Hrs	9

Local replication: Source and target – uses of local replicas – data consistency – local replication technologies – restore and restart considerations – creating multiple replicas – management interfaces – concepts in practice - Remote replications – modes of remote replication technologies – network infrastructure – concepts in practice

Total hours to be taught	45

Text book (s) :

1	EMC Corporation, Information Storage and Management, Wiley India,2010, ISBN:978-81-265-2147-0.

Reference(s) :

1	Robert Spalding storage Networks: The Complete Reference, Tata McGraw Hill, Osborne, 2003.
2	Marc Farley, Building Storage Networks, Tata McGraw Hill, Osborne, 2001.
3	Meeta Gupta, storage Area Networks Fundamentals, Pearson Education Limited, 2002.
4	Dr. Arun Kumar R, Easy Oracle Automation – Oracle 10g, Automatic Storage, Memory and Diagnostic Feartures, 2004, ISBN 0-9745993-6-0.

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Elective I

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E16	DISTRIBUTED COMPUTING	3	0	0	3	50	50	100

Objective(s)	Learning the basics of Distributed Systems, Client Server model and algorithms based on Distributed deadlock, enhancing the knowledge on File Replication and Distributed Operating Systems.

1	INTRODUCTION	Total Hrs	9

Characterization of Distributed Systems - Examples - Resource Sharing and the Web - Challenges - System Models - Architectural and Fundamental Models - Networking and Internetworking - Types of Networks - Network Principles - Internet Protocols - Case Studies.

2	PROCESSES AND DISTRIBUTED OBJECTS	Total Hrs	9

Interprocess Communication - The API for the Internet Protocols - External Data Representation and Marshalling - Client-Server Communication - Group Communication - Case Study - Distributed Objects and Remote Invocation - Communication Between Distributed Objects - Remote Procedure Call - Events and Notifications - Java RMI - Case Study.

3	OPERATING SYSTEM ISSUES – I	Total Hrs	9

The OS Layer - Protection - Processes and Threads - Communication and Invocation – OS Architecture - Security - Overview - Cryptographic Algorithms - Digital Signatures - Cryptography Pragmatics - Case Studies - Distributed File Systems - File Service Architecture - Sun Network File System - The Andrew File System .

4	OPERATING SYSTEM ISSUES – II	Total Hrs	9

Name Services -Domain Name System - Directory and Discovery Services - Global Name Service - X.500 Directory Service - Clocks, Events and Process States - Synchronizing Physical Clocks - Logical Time And Logical Clocks - Global States - Distributed Debugging - Distributed Mutual Exclusion – Elections – Multicast Communication Related Problems.

5	DISTRIBUTED TRANSACTION PROCESSING	Total Hrs	9

Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Timestamp Ordering - Comparison - Flat and Nested Distributed Transactions - Atomic Commit Protocols - Concurrency Control in Distributed Transactions - Distributed Deadlocks - Transaction Recovery - Overview of Replication And Distributed Multimedia Systems.

Total hours to be taught	45

Text book (s) :	
1	George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, 3rd Edition, 2002.
2	Sape Mullender, Distributed Systems, Addison Wesley, 2nd Edition, 1993.

Reference(s):	
1	Andrew S Tanenbaum , Maartenvan Steen,Distibuted Systems –Principles and Pardigms,Pearson Education, 2002.
2	Mugesh Singhal,Niranjan G Shivaratri,Advanced Concepts in Operating Systems,Tata McGraw Hill Edition, 2001.

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Elective II

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 IT E21	CLOUD COMPUTING (CS, IT)	3	0	0	3	50	50	100

Objective(s)	Be able to understand what the current challenges are in cloud computing and be able to understand how to design and implement cloud-based applications.

1	INTRODUCTION	Total Hrs	8

Cloud computing basics: Defining Cloud computing –Cloud Types - Characteristics of Cloud computing – Assessing the role of Open Standards - Measuring the cloud's value - Cloud Architecture: Exploring the cloud computing stack.

2	CLOUD SERVICES AND APPLICATIONS	Total Hrs	10

Understanding Services and Applications by Type: Defining Infrastructure as a service- Defining Platform as a Service- Defining software as a Service – Defining Identity as a Service, Understanding Abstraction and virtualization: Virtualization Technologies – Load Balancing and virtualization-Understanding Hypervisors- Machine Imaging – Porting applications

3	CLOUD PLATFORMS	Total Hrs	9

Platform as a Service: PaaS Applications Frameworks – Using Amazon Web Services: Amazon Web service components and Services – Working with Elastic Compute Cloud (EC2) – Working with Amazon Storage systems- Understanding Amazon Database Services

4	CLOUD SECURITY	Total Hrs	9

Microsoft Cloud Services: Exploring Microsoft Cloud services – Windows Azure Platform,
Cloud Security: Securing the cloud – Securing Data –Establishing Identity and Presence

5	SERVICE ORIENTED ARCHITECTURE AND CLOUD STORAGE	Total Hrs	9

Service Oriented Architecture: Introducing service Oriented Architecture - SOA Communications –Managing and Monitoring SOA. Cloud storage: Provisioning Cloud Storage- Exploring Cloud Backup Solutions.

Total hours to be taught	45

Text book :	
1	Barrie Sosinsky, "Cloud Computing Bible". Wiley Publishing, 2011.

Reference (s) :	
1	Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs". Emereo Pty Limited, 2008.
2	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud". [First Edition]Publisher - Orelly's, 2009

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Elective II

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E21	XML AND WEB SERVICES	3	0	0	3	50	50	100

Objective(s)	The basic aim of this subject is to provide students with insight into XML Web Services, various key technologies for web services, protocol architecture of XML services and also explains how the web services can be developed using XML and also describes various security issues in the XML document.

1	XML BASICS, SOAP INTRODUCTION	Total Hrs	9

Role Of XML – XML and the Web – XML Language Basics – SOAP – Web Services – Revolutions of Xml – Service Oriented Architecture (SOA).

2	DTD, SCHEMA AND NAMESPACES	Total Hrs	9

XML-Namespaces – Structuring With Schemas and DTD – Presentation Techniques – Transformation - XML Infrastructure.

3	SOAP- RPC	Total Hrs	9

Overview Of SOAP-HTTP – XML – RPC – SOAP: Protocol-Message Structure – Intermediaries – Actors –Design Patterns and Faults – SOAP with Attachments.

4	ARCHITECTURE	Total Hrs	9

Overview – Architecture – Key Technologies – UDDI – WSDL – ebXML – SOAP and Web services in E-Com – Overview of .NET And J2EE – Creating ASP.NET Web Services.

5	SECURITIES ISSUES	Total Hrs	9

Security Overview – Canonicalization – XML Security Frame Work – XML Encryption – XML Digital Signature – XKMS Structure – Guidelines for Signing XML Documents – XML in Practice.

Total hours to be taught	45

Text book (s) :

1	Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.

Reference(s) :

1	Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, "Developing Java Web Services", Wiley Publishing Inc., 2004.
2	Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.
3	McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers, 2005.

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<div align="center">Elective II</div>

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E22	EMBEDDED SYSTEM DESIGN	3	0	0	3	50	50	100

Objective(s)	Learning basic Concepts of Embedded System, Advanced Microcontroller, Real-Time operating system, and design process of Embedded system.

1	INTRODUCTION		Total Hrs	7

Features of Embedded Systems – Design Metrics – Embedded Systems Design Flow.

2	ARM: AN ADVANCED MICROCONTROLLER		Total Hrs	11

ARM Microcontroller : ARM Pipeline – Instruction Set Architecture(ISA) –THUMB Instructions – Exception in ARM – Other target architectures: Digital Signal Processors – Field Programmable Gate Array (FPGA) –Interfacing: Serial Peripheral Interface (SPI) – Inter – Integrated Circuit (IIC, I^2C) – RS-232C – RS-422 –
RS-485 – Universal Serial Bus (USB) – Infrared Communications (IrDA) – Controller Area Network (CAN) – Bluetooth.

3	REAL – TIME OPERATING SYSTEM		Total Hrs	9

Types of Real-time Tasks –Task Periodicity – Task Sceduling – Classfication of Scheduling Algorthms – Clock Driven Scheduling – Event Driven Scheduling –Resource Sharing – Other Features of RTOS – Commerical RTOSs –Specification Techniques: Introduction StateChart – Specification and Description Language (SDL) – Petri Nets – Unified Modelling language (UML)

4	HARDWARE – SOFTWARE COSIMULATION		Total Hrs	9

Cosimulation Approaches – A Typical Cosimulation Environment –Hardware-Software Partitioning: Partitioning Using Integer Programming – Extended Kernighan-Lin Heuristic – Partitioning Using Genetic Algorithm – Partitioning Using Particle Swarm Optimization (PSO) – Extended partitioning Problem - Power Aware Partitioning on Reconfigurable Hardware.

5	FUNCTIONAL PARTITIONING AND OPTAMIZATION		Total Hrs	9

Functional Partitioning – High-level Optimizations – Low power Embedded system design: Sources of Power Dissipation –Power Reduction Techniques – System Level power Management.

Total hours to be taught	45

Text book (s) :	
1	Santanu Chattopadhyay , "Embedded System Design" , PHI Learning Pl New Delhi-110001, 2010.

Reference(s) :	
1	**Gajski,** D.D**., Abdi,** S**., Gerstlauer,** A**., Schirner,** G. "Embedded System design ", Springer, 2009
2	Michael Barr and Anthony Massa "Programming Embedded Systems With C and GNU Development Tools", 2nd Edition, Orally publications

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Elective II

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E23	MULTIMEDIA COMPUTING	3	0	0	3	50	50	100
Objective(s)	Learning Concepts of Multimedia Tools, Multimedia Operating Systems, Multimedia Communication Systems, Data Compression and Multimedia Applications							

1	INTRODUCTION TO MULTIMEDIA	Total Hrs	10

Elements of multimedia system – Need and aspects of multimedia - Information units. Sound - Audio file formats – MIDI – Images - Computer Image Processing - Principles of animation - Animation techniques - Creating animated scenes – Video - Basic concepts - Video Capture - Recording format - Storage for multimedia - CD Technologies - Multimedia Workstations

2	MULTIMEDIA TOOLS	Total Hrs	8

Basic tools - Image-editing tool - Painting and drawing tools –Sound editing programs - Video formats - Linking multimedia objects – OLE -presentation tools - authoring tools.

3	MULTIMEDIA OPERATING SYSTEMS	Total Hrs	9

Introduction - Real Time - Resource Management - Process Management - File Systems - Database Systems - Multimedia Database Management System - Characteristics of an MDBMS - Data Analysis - Data Structure - Operations on Data - Integration in a Database Model

4	MULTIMEDIA COMMUNICATION SYSTEMS	Total Hrs	9

Application Subsystem - Transport Subsystem – Synchronization - Introduction - Notion of Synchronization - Presentation Requirements - A Reference Model for Multimedia Synchronization - Synchronization in distributed environment.

5	DATA COMPRESSION AND MULTIMEDIA APPLICATIONS	Total Hrs	9

Source entropy and hybrid coding – JPEG – MPEG - H.261 - DVI. Video conferencing - Tele conferencing – Tele services – messaging services – retrieval services – Tele action services.

Total hours to be taught	45

Text book (s) :

1	Ralf Steinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education Asia, New Delhi, 2002.

Reference(s):

1	Tay Vaughan, "Multimedia: Making it work", sixth edition, Tata McGraw Hill, New Delhi, 2002.
2	Fred Halsall, "Multimedia Communication, Application Networks, Protocols and Standard", fourth edition, Addison Wesley, New Delhi, 2001.
3	John F.Koegal Buford, "Multimedia Systems", Pearson Educational Asia, New Delhi, 2001.
4	Ron, Goldberg, "Multimedia Producer's Bible", fifth edition, Comdex Computer Publishing, New Delhi, 1996.

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Elective II

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E24	MOBILE AD-HOC NETWORKS	3	0	0	3	50	50	100
Objective(s)	Learning about MAC and ad hoc routing protocols and study in detail the transport layer and security protocols for ad hoc network, Quality of service issues and to learn about wireless sensor network							

1	INTRODUCTION	Total Hrs	9

Introduction- Issues – Ad hoc wireless Internet- MAC protocols for ad hoc wireless networks - Classification of MAC protocols - Contention-Based protocols - Contention-Based protocols with Reservation Mechanisms - D-PRMA – CATA– HRMA - SRMA/PA - Contention-Based protocols with Scheduling Mechanisms.

2	AD HOC ROUTING PROTOCOLS	Total Hrs	9

Introduction - Classifications of Routing Protocols - Table-Driven Routing Protocols – On-Demand Routing Protocols -DSR - AODV - TORA – LAR – ABR – Hybrid Routing Protocols.

3	TRANSPORT LAYER AND SECURITY PROTOCOLS FOR AD HOC WIRELESS NETWORKS	Total Hrs	9

Classification of Transport Layer Solutions - TCP Over Ad Hoc Wireless Networks - Security in Ad Hoc Wireless Networks - Network Security Requirements - Network Security Attacks - Key Management - Secure Routing in Ad Hoc Wireless Networks.

4	QUALITY OF SERVICE IN AD HOC WIRELESS NETWORKS	Total Hrs	9

Introduction – Issues - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions – QoS Routing Protocols – Ticket-Based QoS Routing Protocol - PLBQR – TDR - QoS Frameworks for Ad Hoc Wireless Networks.

5	WIRELESS SENSOR NETWORKS	Total Hrs	9

Introduction – Sensor Network Architecture – Data Dissemination- Data Gathering – MAC Protocols for Sensor Networks – Location Discovery – Quality of a Sensor Network.

Total hours to be taught	45

Text book (s) :

1	C. Siva Ram Murthy and B.S. Manoj "Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Education 2004,Reprint 2012.

Reference(s) :

1	S. Rajasekaran, G.A. Vijayalakshmi Pai "Neural Networks, Fuzzy Logic, and Genetic Algorithms ", Prentice Hall PTR, 2005.
2	C.K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 20010. Charles E. Perkins, Ad Hoc Networking, Addison Wesley, 2000.

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Elective II

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E25	SOFTWARE FORENSICS	3	0	0	3	50	50	100
Objective(s)	Learning basic concept of software forensics and studying Player-Hackers, Crackers, Phreaks, and other Doodz, Avanced tools, Law and Ethics-Software forensics in court, Computer Virus and Malware Concepts and Background, Programming Cultures and Indicators, Stylistic Analysis and Linguistic Forensics, Nalysauthorship AIS.							
1	INTRODUCTION TO SOFTWARE FORENSICS, SOFTWARE CODE AND ANALYSIS TOOLS				Total Hrs	9		
Motivations and Rationales - General Characteristics - Black hat Products - Other Products - Summary - The Programming Process Digital Forensic Definitions - Software Forensics - Objectives and Objects of Software Forensics - Identity - Other Object of Study - Software Forensic Tools -The Process - The Products - Finally, Already, the Tools - Software Forensic Technologies and Practices - Content Analysis - Legal Considerations - Presentation in Court – Summary.								
2	THE PLAYER-HACKERS, CRACKERS, PHREAKS, AND OTHER DOODZ				Total Hrs	9		
Terminology -Types of Black hats -The Products -The Resulting Objects -The Analytical Tools -Forensic Tools – Summary.								
3	ADVANCED TOOLS, LAW AND ETHICS-SOFTWARE FORENSICS IN COURT				Total Hrs	9		
Decompilation -Desquirr -Dcc Boomerang -Plagiarism -JPlag -YAP -Other Approaches -summary -Legal Systems - Differences Within Common Law -Jurisdiction -Evidence -Types of Evidence - Rules of Evidence -Providing Expert Testimony -Ethics -Disclosure - Blackhat motivations as a Defense – Summary.								
4	COMPUTER VIRUS AND MALWARE CONCEPTS AND BACKGROUND, PROGRAMMING CULTURES AND INDICATORS				Total Hrs	9		
History of Computer viruses and Worms -Malware Definition and Structure -Virus Structure -Trojan structure -Logic Bomb Structure -Remote Access Trojan (RAT) Structure -Distributed Denial of Service (DDoS) Structure Detection and Antidetection Techniques -Detection Technologies -tealth and Antidetection Measures -Summary -User Interface -Cultural Features and "Help" -Functions -Programming Style -Program structure -Programmer Skill and Objectives - Developmental Strictures -Technological Change –Summary.								
5	STYLISTIC ANALYSIS AND LINGUISTIC FORENSICS, NALYSAUTHORSHIP AIS				Total Hrs	9		
Biblical Criticism -Shakespeare and Other Literature -Individual Identification and Authentication -Content Analysis Noncontent Analysis -The Content/Noncontent Debate -Noncontent Metrics as Evidence of Authorship -Additional Indicators - Summary -Problems - Plagiarism Detection Versus Authorship Analysis -How Can It Work? - Source Code Indicators - More General Indicators - Is It Reliable? – Summary.								
Total hours to be taught						45		
Text book (s) :								
1	Robert M.Slade ,"Software forensics" , Tata McGraw – Hill Publishing Company Limited, New Delhi,2005.								
Reference(s) :								
1	Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to computer forensics and investigations", Cengage Learning, 2010								
2	Bill Nelson, Amelia Phillips, Frank Enfinger, Chris Stewart ," Computer Forensics and Investigations",2004								

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Elective III

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E31	DECISION SUPPORT SYSTEMS AND INTELLIGENT SYSTEMS	3	0	0	3	50	50	100

Objective(s)	Learning development of support system, methods, intelligent decision system development

1	INTRODUCTION	Total Hrs	9

Decision making, Systems, Modeling, and support – Introduction and Definition – Systems – Models – Modeling process – Decision making: The intelligence phase – The design phase - The choice phase – Evaluation: The implementation phase –Alternative Decision Making-Design Support System concepts, Methodologies and Technologies: DSS characteristics & capabilities - Concepts of Decision Support System - DBMS subsystem - Model Management Subsystem - User-interface subsystem - Knowledge Based Management Subsystem - Decision Support System User - Decision Support System Hardware - Decision Support System Classifications.

2	DECISION SUPPORT SYSTEM MODELING & BUSINESS INTELLIGENCE	Total Hrs	9

Modeling and Analysis- Management Support System Modeling - Static & Dynamic Models - Certainty, Uncertainty Risk - Decision Analysis with Decision Tables and Trees - Problem – solving search methods -Data warehousing - Business analysis and visualization - Data, Tent and Web mining. .

3	KNOWLEDGE MANAGEMENT	Total Hrs	9

Introduction – Organization – learning & Transformation – Knowledge Management activities – Approaches to Knowledge Management – Information Technology in Knowledge Management – Knowledge Management System Implementation – Role of people in Knowledge Management - Ensuring the success of Knowledge Management

4	INTELLIGENT SYSTEM DEVELOPMENT	Total Hrs	9

Artificial intelligence and Expert System – Machine learning techniques – Case Based Reasoning (CBR) – Generic Algorithm fundamentals – fuzzy logic fundamentals -Natural language processing – Voice Technologies web-base Intelligent System – Intelligent Agent's – Semantic Web.

5	IMPLEMENTING INTELLIGENT DECISION SUPPORT SYSTEMS	Total Hrs	9

Types of support System landscape and Management Model Support System application Development – Development option for Management Model Support System application – Prototyping – Criteria for selecting Management Model Support System - development Approach connecting to database – Risk to Web series – user developed management support – System Integration – Types of Management Model Support System Support System and knowledge Management – System Integration – Types of Management Model Support System integration – Integration with enterprise system and knowledge management.

Total hours to be taught	45

Text Book(s) :	
1	Efrain Turban, Jay E.Aronson, Teng-Peng Liang, Ramesh Sharada "Decision Support Systems and Intelligent Systems" 8th Edition, Pearson Education, 2007.

Reference(s):	
1	Ganesh Natarajan, Sandhya Shekhar, "Knowledge management – Enabling Business Growth", Tata McGraw-Hill, 2002.
2	George M.Marakas, "Decision Support System", Prentice Hall, India, 2003.
3	Efrem A.Mallach, "Decision Support and Data Warehouse Systems", Tata McGraw-Hill, 2002.

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Elective III

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E32	ARTIFICIAL INTELLIGENCE	3	0	0	3	50	50	100

Objective(s)	Understanding the genesis of Artificial Intelligence. Studying the applications of Artificial Intelligence.	
1	INTRODUCTION	Total Hrs	9

Basic definitions, History, Intelligent agents, Agents and environments, Structure of agents.

2	PROBLEM SOLVING AGENTS	Total Hrs	9

Searching for solutions: Uninformed search strategies – Informed search strategies, Online search agents and unknown environments, Constraint satisfaction problems.

3	KNOWLEDGE BASED AGENTS	Total Hrs	9

Knowledge representation, Logic, Proposition, Inference, First order logic, Inference in FOL, Algorithms, Knowledge representation issues.

4	PLANNING AND PROBABILISTIC AGENTS	Total Hrs	9

The planning problem, Partial order planning, Conditional planning, Multi agent planning, Uncertainty and probabilistic reasoning.

5	LEARNING AGENTS AND APPLICATIONS	Total Hrs	9

Learning from observations, Learning decision trees, Statistical learning methods, Instance based learning, Neural network techniques for learning. Applications - Artificial intelligence in medicine, Industrial automation, FMS and Robotics, Management and business intelligence.

Total hours to be taught	45

Text book (s) :

1	Stuart Russel, Peter Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, New Delhi, 2008.

Reference(s):

1	Mishra R B., "Artificial Intelligence", PHI Learning Pvt Ltd, New Delhi, 2011.
2	Padhy N. P., "Artificial Intelligence and Intelligent Systems", Oxford University Press, New Delhi, 2005.
3	Nils J Nilsson, "Artificial Intelligence – A New Synthesis", Morgan Kaufmann, New Delhi, 2007
4	George F Luger, "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", Pearson Education, New Delhi, 2004.
5	Dan W Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI Learning Pvt. Ltd., New Delhi, 2010.

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Elective III

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E33	OBJECT ORIENTED PROGRAMMING IN PYTHON	3	0	0	3	50	50	100
Objective(s)	Gaining knowledge in Object Oriented Programming paradigm with python, studying about objects, inheritance, polymorphism, data structures, exception handling, files, strings and testing of open source language python.							

1	OBJECT-ORIENTED DESIGN	Total Hrs	9

What is Object-oriented? - Objects and classes- Specifying attributes and behaviors- Hiding details and creating the public interface- Composition and inheritance- Inheritance

2	OBJECTS IN PYTHON	Total Hrs	9

Creating Python classes - Modules and packages - Organizing the modules- Absolute imports- Relative imports

3	INHERITANCE AND POLYMORPHISM	Total Hrs	9

Extending built-ins- Overriding and super- Multiple inheritance- Polymorphism

4	PYTHON DATA STRUCTURES AND EXCEPTION HANDLING	Total Hrs	9

Empty objects- Tuples and named tuples- Dictionaries- Lists- Sets - Raising exceptions- What happens when an exception occurs?- Handling exceptions- Exception hierarchy- Defining our own exceptions- Exceptions aren't exceptional

5	FILES, STRINGS AND TESTING OBJECT-ORIENTED PROGRAMS	Total Hrs	9

String manipulation-String formatting- File IO -Why test?-Unit testing-testing with py.test- How much testing is enough?

Total hours to be taught	45

Text book (s) :

1	Dusty Phillips "Python 3 Object Oriented Programming " 2010 Packt Publishing

Reference(s):

1	James Payne "Beginning Python using Python 2.6 and Python 3.1" 2010 Willey India Pvt Ltd
2	Wesley J. Chun, "Core Phython Programming", Prentice Hall, 2001

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Elective III

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E34	TRUST COMPUTING	3	0	0	3	50	50	100

Objective(s)	Learning logics of programming , trust management approaches, Distributed trust model, design and its management in ad-hoc networks

1	LOGIC PROGRAMMING	Total Hrs	9

Introduction - Basics of logic and logic programming – definite logic programs – SLD resolution principle

2	TRUST MANAGEMENT APPROACHES	Total Hrs	9

Overview of trust management approach - Distributed authorization – trust management approach – characteristics – Public Key Certificates –Existing Public key infrastructures – X.509 and PGP.

3	TRUAST MANAGEMNET LANGUAGES	Total Hrs	9

Early trust management languages and approaches - PolicyMaker – KeyNote – SPKI(Simple Public Key Infrastructure) – Simple Distributed Security Infrastructure (SDSI) – Datalog based trust management languages – other closely related logic based security languages.

4	DISTRIBUTED TRUST MODEL & DESIGN	Total Hrs	9

Decentralized trust management - Distributed credential chain discovery in trust management – Design of a role based trust management framework.- Distributed trust model

5	TRUST MODELING AND MANAGEMENT IN AD HOC NETWORKS	Total Hrs	9

Related Work on Trust Modeling and Management in Ad hoc Networks Distributed Trust Model – Trust Evaluation and Metrics in Mobile Ad hoc Network – Establishing Trust in Pure Ad hoc Networks – Incorporating trust and reputation in DSR for dependable routing – Performance Comparison of Trust-Based reactive routing protocols – Trust Management vulnerabilities in distributed networks.

Total hours to be taught	45

Text book (s) :

1	Krzysztof R. Apt. Logic Programming. Handbook of theoretical computer science,Elsevier 1990.

Reference(s) :

1	Matt Blaze, Joan Feigenbaum, and Jack Lacy. Decentralized Trust Management. In *Oakland*, 1996.
2	M. Blaze, J. Feigenbaum, J. Ioannidis, and A. Keromytis. The KeyNote Trust-Management System Version 2. Network Working Group RFC 2704, September 1999.

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Elective III

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E35	SECURITY ISSUES IN AD-HOC NETWORKS	3	0	0	3	50	50	100
Objective(s)	Learning basic Security concepts, and Secure Routing Secure Routing, Protocols, Data Communication in Adhoc networks Detection and Preventions of Attacks							

1	BASIC SECURITY CONCEPTS	Total Hrs	9

Introduction and Basic Security Concepts - Threats, Attacks and Vulnerabilities in Ad hoc Networks – Basic Security Concepts – Cryptographic Primitives – Modes of operation – Miscellaneous Properties, Key Management – Symmetric and Asymmetric based approaches

2	SECURE ROUTING	Total Hrs	9

Distance vector and Link-state routing – Ad-hoc On-demand Distance Vector – Secure AODV,Authenticated Routing for Ad Hoc Networks, Security Aware Ad Hoc Routing Dynamic Source Routing Protocol – Secure Routing Protocol – Ariadne – Endair – A provably secure routing protocol, Secure – AODV implementation and performance tuning – Secure Neighbourhood discovery in MANETs.

3	ROUTING PROTOCOLS	Total Hrs	9

Destination Sequenced Distance Vector Routing Protocol – Secure Efficient Distance Vector Routing (SEAD) – SuperSEAD – S-DSDV, Optimized Link State Routing – Secure extensions – Secure Link-state routing. Anonymous routing protocols and Generic attacks against routing,Reputation Based Systems, Credit Based Systems,. Limitations of these systems

4	HYBRID SOLUTIONS,SMT,SSP	Total Hrs	9

Game theory solutions – Limitations - Hybrid Solutions to security. Other proposed schemes in security. Secure Data Communication in Mobile Ad hoc Networks. SMT and SSP protocols

5	DETECTION AND PREVENTION	Total Hrs	9

Key Challenges of Military Tactical Networking – Worm hole attack detection and prevention in ad hoc networks. Sybil attacks – Detection and prevention – Existing solutions for other wellknown attacks.

Total hours to be taught	45

Text book (s) :	
1	Farooq Anjum, Petros Mouchtaris "Security for Wireless Ad hoc Networks", Wiley Publications, 2007.

Reference(s) :	
1	George Aggelou "Mobile Ad Hoc Networks", McGrawHill, 2004
2	Younghwan Yoo And Dharma P. Agrawal Why Does It Pay To Be Selfish In A Manet, IEEE Wireless Communications, December 2006

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Elective III

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E36	SERVICE ORIENTED ARCHITECTURE	3	0	0	3	50	50	100
Objective(s)	Learning about basic fundamentals of SOA, Learning about message exchange patterns, learning about service oriented architecture, learning about SOA delivery strategies and WSDL							

1	SOA INTRODUCTION	Total Hrs	9

Fundamental SOA-Common characteristics of contemporary SOA- Common-misperceptions about SOA- Common tangible benefits of SOA- Common pitfalls of adopting SOA - An SOA timeline (from XML to Web services to SOA)- The continuing evolution of SOA (standards organizations and contributing vendors)- The roots of SOA(comparing SOA to past architectures) - The Web services framework- Services (as Web services)-Service descriptions (with WSDL)-Messaging (with SOAP).

2	MESSAGE AND METADATA EXCHANGE	Total Hrs	9

Message exchange patterns- Serviceactivity-coordination-Atomic transactions- Business activities- Orchestration-Choreography - Addressing- Reliable messaging- Correlation-Policies- Metadata exchange- Security- Notification and eventing.

3	SOA ARCHITECTURE	Total Hrs	9

Principles of Service-Orientation-Service-orientation and the enterprise- Anatomy of a service-oriented architecture- Common principles of service-orientation-How service-orientation principles inter-relate-Section-Service-orientation and object-orientation-Native Web service support for service-orientation principles. - Service Layers –Service orientationand contemporary SOA- Service layer abstraction-application service layer-Business service layer- Orchestration service layer-Agnostic services- Service layer configuration scenarios.

4	SOA DELIVERY STRATEGIES, SERVICE MODELING	Total Hrs	9

SOA Delivery Strategies- SOA delivery lifecycle - phases- The top-down strategy- The bottom-up strategy- The agile strategy - Introduction to service-oriented analysis- Benefits of a business-centric SOA- Deriving business services - Service modeling (a step-by-step process)-Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches (an example).

5	SOA DESIGN	Total Hrs	9

Introduction to service-oriented design- WSDL-related - XML Schema language basics- WSDL language basics-SOAP language basics- Service interface - design tools - Steps to composing SOA Considerations for choosing service layers and SOA standards, positioning of cores and SOA - extensions - Overview-Service design of business service, application service, taks centric service and guidelines - WS-BPEL language basics-WSC oordination overview- Service-oriented business process design (a step-by-step process).

Total hours to be taught	45

Text book (s) :	
1	Thomas Erl ," Service-Oriented Architecture: Concepts, Technology & Design", Pearson Education Pte Ltd 2008.

Reference(s) :	
1	Thomas Erl,"SOA Principles Of Service Design"Pearson Exclusives 2007.
2	Tomas Erl and Grady Booch,"SOA Design Patterns"Printice Hall 2008

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Elective IV

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E41	PARALLEL COMPUTING	3	0	0	3	50	50	100

Objective(s)	Studying the scalability and clustering issues and the technology necessary for them, understanding the technologies enabling parallel computing, studying the different types of interconnection networks, studying the different parallel programming models, studying the software support needed for shared memory programming.

1	SCALABILITY AND CLUSTERING	Total Hrs	9

Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts Of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues – Semantic Issues In Parallel Programs.

2	ENABLING TECHNOLOGIES	Total Hrs	9

System Development Trends – Principles of Processor Design – Microprocessor Architecture Families – Hierarchical Memory Technology – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding.

3	SYSTEM INTERCONNECTS	Total Hrs	9

Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.

4	PARALLEL PROGRAMMING	Total Hrs	9

Paradigms And Programmability – Parallel Programming Models – Shared Memory Programming.

5	MESSAGE PASSING PROGRAMMING	Total Hrs	9

Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine.

Total hours to be taught	45

Text book (s) :	
1	Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi, 2003.

Reference(s):	
1	David E. Culler & Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/Software Approach", Morgan Kaufman Publishers, 1999.
2	Michael J. Quinn, "Parallel Programming in C with MPI & OpenMP", Tata McGraw-Hill, New Delhi, 2003
3	Kai Hwang, "Advanced Computer Architecture" Tata McGraw-Hill, New Delhi, 2003.

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Elective IV								

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E42	TEXT MINING	3	0	0	3	50	50	100
Objective(s)	Understanding the concepts of text mining and applications along with programming, Exploring Text, Markov Models and POS Tagging, Searching the Web, knowing Text Categorization							

1	INTRODUCTION, TEXT MINE INSTALLATION, MATHEMATICS BACKGROUND	Total Hrs	9

Origins of Text Mining - Information Retrieval- Natural Language Processing Understanding Text- Polysemi Synonymy- Applications- Business- Medicine and Law- Society-Information Visualization-An Architecture for Text Mining Applications -Text Mining Functions- A Layered Model-Software- Usage - Probability-Least Squares Method- Entropy-Related-Event Probabilities-Bayer's Rule-Probability Distributions-Binomial Distribution-Poisson Distribution- Normal Distribution-Sampling Distributions-T-Distribution Estimation-Expectation Maximization Algorithm-Hypothesis Testing-Chi-Square Test- Matrices Singular value Decomposition.

2	EXPLORING TEXT, MARKOV MODELS AND POS TAGGING	Total Hrs	9

Words-Token Assembly- Word Stems-Base Words-Word and Meaning Relationships- Patterns in Words and Letters- Word Statistics-Zipf's Law-Sentences-Indexing Document Text- Frequency-Based- Stop words Inverse Document Frequency-Latent Semantic Indexing. hidden Markov Models-Observation Probability- State Sequence-Parameter Estimation-POS Taggers-HMM Taggers-Rule – Based Taggers-Building a Tagger-Word Sense Disambiguation-A Implementation of a WSD- Evaluation of WSDs.

3	INFORMATION EXTRACTION, SEARCH ENGINES	Total Hrs	9

IE Applications-Entity Extraction-HMMs for Entity Extraction -Implementation of an Entity Extractor Systems-Festus- Rapier-Phrase Extraction -Early Search Engines-Medline –Dialog- Indexing Text for Search- An Implementation in Text Mine Google Index-Indexing Multimedia-Queries-Boolean Queries- Multimedia Queries-Relevance Feedback-Searching an Index- Searching in Text Mine-Google Search-Evaluation-Ranking Algorithms Link Structure of Web Pages-Viewing Search Results.

4	SEARCHING THE WEB	Total Hrs	9

Web Structure-Search Engine Coverage- Web Directories-A Distributed Search- Web Communities-The Hidden Web-Crawlers- Web Search Engine Crawlers-Focused Crawlers-Text Mine Crawler Crawl Visualization--Clustering Documents-Cluster Organization Cluster –Parameters- Cluster – Based Search- Searching with a Taxonomy- Similarity Measures-Linking Methods Clustering Methods-K-Means-Simulated Annealing-Genetic Algorithms- Scatter\Gather-Visual Tools for Clusters-Cluster Evaluation.

5	TEXT CATEGORIZATION	Total Hrs	9

Categorization Problem- Filtering Email-A Bayesian Email Filter-Features of Spam-Requirements for a Spam Detector-An Email Archive-Email Categorization -Email Monitor-Personal Email Network-Chain EmaiCategorization Methods-Rocchio's Algorithm-Perceptions-Decision Trees-Nearest Neighbor-Support Vector Machines-Summarization-Training a Summarizer-Sentence Selection-News Articles- Email Threads-Web Pages-A Cluster-Based Summarizer-Implementation of a Summarizer-Evaluation of Summaries-Information Monitor-Event Detection-Event Tracking- Monitoring the News- Sentiment Analysis.

Total hours to be taught	45

Text book (s) :	
1	Manu Konchady, "Text Mining Application Programming ", India edition, Cengage Leaning, 2006.

Reference(s) :	
1	Michael W. Berry, Jacob Kogan, quot,"Text Mining: Applications and Theory", Wiley, 2010.
2	Louise Francis and Matt Flynn, "Text Mining Handbook". Spring, 2010.

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Elective IV

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E43	SEMANTIC WEB	3	0	0	3	50	50	100

Objective(s)	Introducing basic concepts, tasks, methods, and techniques in semantic web, understanding of the semantic web process and issues.

1	INTRODUCTION	Total Hrs	8

History – Semantic Web Layers –Semantic Web technologies – Semantics in Semantic Web – XML**:** Structuring – Namespaces – Addressing – Querying – Processing

2	RDF	Total Hrs	10

RDF and Semantic Web – Basic Ideas - RDF Specification – RDF Syntax: XML and Non- XML - RDF elements – RDF relationship: Reification, Container, and collaboration – RDF Schema –Editing, Parsing, and Browsing RDF/XML-RQL-RDQL

3	ONTOLOGY	Total Hrs	10

Why Ontology – Ontology movement – OWL – OWL Specification - OWL Elements –OWL constructs: Simple and Complex – Ontology Engineering : Introduction –Constructing ontologies – Reusing ontologies – On-To-Knowledge Semantic Web architecture

4	LOGIC AND INFERENCE	Total Hrs	9

Logic – Description Logics - Rules – Monotonic Rules: Syntax, Semantics and examples – Non- onotonic Rules – Motivation, Syntax, and Examples – Rule Markup in XML: Monotonic Rules, and Non-Monotonic Rules

5	APPLICATIONS OF SEMANTIC WEB TECHNOLOGIES	Total Hrs	8

RDF Uses: Commercial and Non-Commercial use – Sample Ontology – e-Learning –Web Services – Web mining – Horizontal information – Data Integration – Future of Semantic Web

Total hours to be taught	45

Text book (s) :	
1	Grigorous Antoniou and Van Hermelen - "A Semantic Web Primer"-The MIT Press –2004
2	Spinning the Semantic Web: Bringing the world wide web to its full potential – The MIT Press – 2004
Reference(s):	
1	Shelley Powers – "Practical RDF" – O'reilly publishers – First Indian Reprint :2003

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Elective IV

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E44	AGILE SOFTWARE METHODOLGY	3	0	0	3	50	50	100

Objective(s)	L earning about basic concepts and methodologies of agile

1	INTRODUCTION	Total Hrs	9

A cooperative Game of Invention and Communication - Software and poetry, Software and Games - Software and Rock Climbing - A Game of Invention and Communication – Software and Engineering - Software and model Building

2	OPEN SOURCE DEVELOPMENT	Total Hrs	9

A second look at the cooperative Game - Programmers as communications specialists –Sufficiency for the primary goal – Sufficiency in the residue - Open source development

3	CHARACTERISTIC FUNCTION	Total Hrs	9

THEM's Funky people - The quest for a characteristic function - Elements of Funkiness - Inescapable Diversity – The place of technology, Overcoming Failure modes - Making Mistakes -Inventing Rather than Researching - Countering with Discipline and Tolerance, Drawing on Success Modes –Good at looking around- People Learn- Contributing and Taking Initiative -Combining Success Modes – Heroes as ordinary people

4	COOPERATING TEAMS, OSMOTIC COMMUNICTION	Total Hrs	9

Communicating, cooperating Teams - Convection currents of Information - Delays and lost opportunity costs - Erg seconds - Osmotic communication – Drafts - Information Radiators –Applying the theory of Hot Air, Jumping Communication Gaps- Modalities in communication –The impact of removing Modalities – Making use of Modalities

5	DESIGN METHODOLOGY AND DESIGN PRINCIPLES	Total Hrs	9

Methodologies - Methodology concepts – Structural terms - Scope, Methodology Design Principles – Seven Principles, XP under Glass –Dissecting XP – Adjusting XP, Agile and Self Adapting - Agile - Sweet Spots –The Trouble with Virtual Teams, Agile models.

Total hours to be taught	45

Text book (s) :	
1	Alistair Cockburn, "Agile Software Development - The Agile Software Development Series", Addison Wesley, 2002.

Reference(s) :	
1	Mike Cohn, "Succeeding with agile software development using scrum" Kindle Edition, 2009.
2	Scott Ambler, " Agile Modeling: Effective Practices for extreme programming and Unified Process", Kindle Edition, 2002.
3	Ken Schwaber, Mike Beedle, "Agile Software Development with Scrum", 2001

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Elective IV

Course Code	Course Name	Hours/Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E45	SOFTWARE QUALITY ASSURANCE	3	0	0	3	50	50	100

Objective(s)	Knowing about the accuracy of the software quality assurance process, learning about various testing strategy to assure the quality.

1	FUNDAMENTALS OF SOFTWARE QUALITY ASSURANCE		Total Hrs	9

The Role of SQA – SQA Plan – SQA considerations – SQA people – Quality Management – Software Configuration Management.

2	MANAGING SOFTWARE QUALITY		Total Hrs	9

Managing Software Organizations – Managing Software Quality – Defect Prevention – Software Quality Assurance Management.

3	SOFTWARE QUALITY ASSURANCE METRICS		Total Hrs	9

Software Quality – Total Quality Management (TQM) – Quality Metrics – Software Quality Metrics Analysis

4	SOFTWARE QUALITY PROGRAM		Total Hrs	9

Software Quality Program Concepts – Establishment of a Software Quality Program – Software Quality Assurance Planning – An Overview – Purpose & Scope.

5	SOFTWARE QUALITY ASSURANCE STANDARDIZATION		Total Hrs	9

Software Standards–ISO 9000 Quality System Standards - Capability Maturity Model and the Role of SQA in Software Development Maturity – SEI CMM Level 5 – Comparison of ISO 9000 Model with SEI's CMM.

Total hours to be taught	45

Text book (s) :	
1	Mordechai Ben-Menachem / Garry S Marliss, "Software Quality", Vikas Publishing House, Pvt, Ltd., New Delhi.(UNIT III to V)
2	Watts S Humphrey, "Managing the Software Process", Pearson Education Inc.(UNIT I and II).

Reference(s):	
1	Gordon G Schulmeyer, "Handbook of Software Quality Assurance", Third Edition, Artech House Publishers 2007
2	Nina S Godbole, "Software Quality Assurance: Principles and Practice", Alpha Science International, Ltd, 2004

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Elective IV

Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ES	Total
10 CS E46	WIRELESS SENSOR NETWORKS	3	0	0	3	50	50	100

Objective(s)	Learning sensor Networks, Models, Network Sensor, sensor tasking and Control, Sensor network databases, sensor network platforms and tools.

1	INTRODUCTION TO SENSOR NETWORKS	Total Hrs	9

Unique Constraints and Challenges – Advantages of Sensor networks – Sensor network applications – Collaborative processing – Key definition of sensor networks – A tracking scenario – problem formulation – Distribution representation and inference of states – Tracking multiple objects – Sensor models – Reference compression and metrics.

2	NETWORK SENSOR	Total Hrs	9

Key assumptions – Medium access control – General Issues – geographic Energy aware routing – Attribute based routing

3	INFRASTRUCTURE ESTABLISHMENT, SENSOR TASKING AND CONTROL	Total Hrs	9

Topology control – Clustering – Time Synchronization – Localization and localization services - Task driven sensing Roles of Sensor nodes and Utilizes – Information based sensor tasking – Joint routing and Information Aggregation.

4	SENSOR NETWORK DATA BASES	Total Hrs	9

Sensor Data base challenges – Querying the Physical Environment – Query Interfaces – High level Data Base organization – In Network aggregation – Data Centric storage – Data indices and Range queries – Distributed hierarchical aggregation – temporal Data

5	SENSOR NETWORK PLATFORMS AND TOOLS	Total Hrs	9

Sensor node hardware – sensor network programming challenges – node level software plat form – node level simulators – Programming beyond individual modes state – centric programming –Emerging applications of wireless sensor networks.

Total hours to be taught	45

Text book (s) :

1	Fenz Zhan.Leonidas Guibas "Wireless Sensor Networks "– An information processing approach. Elsevir Inc – 2004. ISBN 1-55860-914-8.

Reference(s) :

1	Edger H.Dr.Calleway Edger .H auerbach Publication "Wireless Sensor Networks – Architecture and Protocols ". Auerbach Publications (August 26,2003) ISBN 0849318238
2	P.Papadomitratos *et al.*, Secure Neighbourhood Discovery; A fundamental element for Mobile Ad hoc Networks, IEEE Communications Magazine, February 2008

Electives - Course Outcomes (COs)

Modules	10 CS E11- Data Mining Course Outcomes (COs) At the end of the course, the student will be able to
1	Elucidate the basic concept of Data Mining
2	Discuss the issues related to data mining
3	Explore about multidimensional model
4	Expected to understand about cube operations
5	Narrate the steps of data preprocessing
6	Enumerate about multidimensional association rules
7	Discuss different classification techniques
8	State association rule mining and its applications
9	Outline different clustering techniques
10	Describe about outlier analysis and its applications

Modules	10 CS E12 - Advanced Computer Architecture Course Outcomes (COs) At the end of the course, the student will be able to
1	Comprehend the fundamental concepts of computer design
2	Describe about the concepts of Instruction set, pipelining and hazards
3	Acquire the knowledge Dynamic Scheduling and Dynamic hardware prediction
4	Obtain knowledge about Hardware based speculation and Limitations of ILP.
5	Implement ILP with software approaches
6	Formalize static branch prediction and VLIW
7	Characterize cache memory and main memory organization
8	Differentiate different types of storage devices and RAID
9	Apply the concepts of shared and distributed memory architectures
10	Describe Synchronization and Multithreading

Modules	10 CS E13 - User Interface Design Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Understand the human-computer interface and its characteristics
2	Identify the characteristics of web user interface
3	Analyze the user interface design process and its usability
4	Develop the requirement analysis and human considerations in screen design
5	Create the process for designing of menus
6	Understand the steps involved in designing of windows
7	Identify the device based controls and its characteristics
8	Analyze the screen based controls and its characteristics
9	Develop steps for designing of web pages
10	Understand the designing of windows layout

Modules	10 CS E14 - Pattern Recognition Techniques Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Know the basis pattern recognition and feature extraction concepts
2	Interpret the pattern recognition approaches in various applications
3	Implement the fundamental concept of statistical pattern recognition
4	Demonstrate the supervised learning methods using parametric and non parametric approaches
5	Recognize the binary classification problems and to obtain linear classifiers
6	Implement the concept of clustering for unsupervised learning
7	Employ the parsing and grammar concept using Syntactic pattern recognition
8	Develop the graphical and learning approaches for syntactic pattern recognition
9	Illustrate the concept of neural networks trained by back propagation techniques
10	Create the memory approaches and to observe unsupervised learning neural pattern recognition

Modules	10 CS E15 - Information Storage and Management Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Understand the origin of storage systems and observe the information life cycle
2	Interpret the various storage resources for storing the information
3	Classify the connectivity between the storage devices and servers
4	Recognize the connection between the storage host and bridging device over IP using iSCSI
5	Understand the concepts of object based system in content addressed storage
6	Analyse the technique of masking or abstracting physical resources
7	Recognize the business continuity process for mitigating impact of planned and unplanned downtime
8	Recognize the back technology to restore the data in the event of data loss
9	Analyse the concept of local replication technologies
10	Analyze the uses of remote replication technologies

Modules	10 CS E16 - Distributed Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Observe the characterization and challenges in Distributed Systems.
2	Analyze various models of distributed systems and compare the types of Networks.
3	Identify the purpose of Marshalling and Un-marshalling
4	Recognize the purpose of inter process communication with the help of RMI.
5	Compare Process and threads with its features.
6	Appraise the techniques to provide security with the help of various cryptographic algorithms
7	Identify the purpose of Domain Name Service.
8	Acquire the needs of Logical clocks and observe the features of Mutual exclusion
9	Acquire the concept of Locks and compare flat and nested transactions
10	Observe ACID properties in concurrency control in distributed transactions

Modules	10 IT E21- Cloud Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Know the Characteristics of Cloud computing and its types
2	Understand the Architecture of Cloud Computing and assessing the role of open standards
3	Illustrate the Cloud service models and Cloud Deployment Models
4	Apply knowledge of Abstraction, and Virtualization Technologies using hypervisors
5	Develop an application using Paas Application frameworks
6	Demonstrate how to use Amazon Web Services(EC2) and Storage Systems to deploy the applications in the cloud environment
7	Explore the Microsoft Cloud services- windows Azure Platform
8	Reveal the major security and privacy problems in the Cloud with security mechanisms
9	Understand the purpose of Service Oriented Architecture(SOA)
10	Demonstrate to work with Cloud-Based storage

Modules	10 CS E21 - XML and Web Services Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Gain the Knowledge in basics of xml language
2	Acquire the knowledge of web services and identify the ways in which they can benefit organizations.
3	Describe the basics of XML schemas and namespaces.
4	Analyze xml presentation, transformation and infrastructure techniques.
5	Explain the concept and usage of SOAP protocol.
6	Obtain the knowledge of Soap message structure.
7	Observe the concept of web services architecture.
8	Understand xml key technology.
9	Gain knowledge in fundamental xml security elements.
10	Recognize xml security framework.

Modules	10 CS E22 - Embedded System Design Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Identify the features of embedded systems
2	Analyze the process of embedded system design
3	Comprehend the design of ARM Microcontroller
4	Justify infrared and Bluetooth communication
5	Analyze the design of real time operating system
6	Identify various specification techniques
7	understand the hardware-software co simulation approaches and environment
8	Develop the hardware-software partitioning techniques
9	Implement functional partitioning in embedded system
10	Develop optimization techniques and low power embedded system design

Modules	10 CS E23 - Multimedia Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Examine Different elements of Multimedia system and parameters involved in multimedia application
2	Observe Different storage media for multimedia
3	Comprehend Multimedia editing tools for audio, video and image
4	Analyze Linking multimedia objects
5	Outline Real-time, process and resource management
6	Examine different Database management system for multimedia
7	Predict Multimedia communication subsystems
8	Generate Multimedia synchronization reference model
9	Compare Different data compression techniques
10	Gain knowledge about Multimedia applications

Modules	10 CS E24 – Mobile Ad-Hoc Networks Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Comprehend the basics of Mobile ad-hoc networks and its Issues
2	Secure the knowledge of Content Based Protocols with the different Mechanisms
3	Acquire knowledge of the classifications and features of different Ad Hoc Routing Protocols
4	Acquire knowledge of the different transport layer solutions
5	Gain the knowledge of different transport layer protocols in Mobile Ad-Hoc Networks
6	Gain the knowledge of the Security aspects of Ad Hoc Wireless Networks
7	Secure the knowledge of the security protocols in Mobile Ad-Hoc Networks
8	Acquire knowledge of different QoS protocols in Mobile Ad-Hoc Networks
9	Comprehend the basic concept of wireless Sensor Networks
10	Acquire knowledge of the Issues in the wireless Sensor Networks and their solutions

Modules	10 CS E25 - Software Forensics Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Realize basics of Software Forensics
2	Acquire knowledge on the Software Forensics technologies and practices
3	Comprehend the knowledge on players
4	Realize the various basic software forensics tools
5	Attain knowledge on advanced tools
6	Comprehend the law and ethics of forensics
7	Identify various computer viruses and malware
8	Attain knowledge on programming cultures
9	Perform stylistic analysis and linguistic forensics
10	Comprehend the plagiarism and authorship analysis

Modules	10 CS E31 - Decision Support Systems and Intelligent Systems Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Know the concepts of different phases of decision making and evaluation.
2	Understand the decision support system concepts and methodologies.
3	Describe the concept of decision support techniques.
4	Understand the concept of business analysis and visualizations.
5	Describe the approaches of knowledge management.
6	Discuss the success of knowledge management.
7	Understand the concepts of expert systems.
8	Apply the knowledge of machine learning techniques.
9	Discuss the ideas of Management Model Support System application.
10	Understand the knowledge management and enterprise system.

Modules	10 CS E32 - Artificial Intelligence Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Understand the concepts of intelligence agent.
2	Describe the ideas of structure of agents.
3	Know the performance of problem solving agents.
4	Interpret the knowledge of searching strategies.
5	Analyze the issues of knowledge representation.
6	Interpret the knowledge of logics, proposition and interface.
7	Understand the issues of planning problems.
8	Describe the Uncertainty and probabilistic reasoning.
9	Discuss about neural network techniques for learning.
10	Understand use the leaning agents for applications.

Modules	10 CS E33– Object Oriented Programming in Python Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Comprehend the concepts of Object Oriented Design and its characteristics
2	Create and Implement the objects in Python
3	Create and Implement the modules and packages in Python
4	Comprehend the concepts of Inheritance and polymorphism
5	Implement the concepts of Inheritance and Polymorphism in Python
6	Comprehend different data structures in Python and implement them
7	Comprehend different Exception handling techniques in Python and implement them
8	Comprehend the String manipulations in Python and implement them
9	Comprehend the I/O file operations in Python and implement them
10	Acquire the knowledge of testing in Python

Modules	10 CS E34 - Trust Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Know the issues of logic programming.
2	Understand the concepts of logic programming.
3	Understand the overview of trust management approaches.
4	Analyze the use of public key.
5	Describe the concept trust management languages.
6	Interpret the use of security infrastructure.
7	Discuss the issues of distributed trust models.
8	Interpret the Design of a role based trust management framework.
9	Understand the Trust Modeling and Management in Ad hoc Networks.
10	Discuss the Comparison of Trust-Based reactive routing protocols

Modules	10 CS E35 - Security Issues in Ad-Hoc Networks Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Gain the knowledge of basic security concepts and secure routing vulnerabilities in MANET
2	Understand the cryptographic basics and symmetric and asymmetric approaches
3	Acquire the knowledge of basic on demand routing protocol in MANET
4	Obtain a knowledge of secure routing protocols and its working principle
5	Acquire the knowledge of proactive routing protocols and its working principle
6	Obtain knowledge of secure proactive routing protocols and its working principle.
7	Gain a knowledge of game theory solutions and its limitations
8	Obtain a knowledge of hybrid solutions and other protocols
9	Gain the knowledge about the key challenges of Military tactical networking and various attacks
10	Analyze the existing solutions for other well known attacks

Modules	10 CS E36 - Service Oriented Architecture Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Recognize the fundamentals, characteristics, benefits and pitfalls of SOA
2	Investigate the use of webs services, service descriptions and messaging
3	Review the activity management and composition of SOA
4	Examining the methods of messaging, policies, metadata and security
5	Comprehend the principles of service-orientation for web service
6	Interpret the information about different service layers and compare them
7	Compare the concepts of different SOA delivery strategies
8	Infer about the service-oriented analysis and process
9	Interpret the importance service-oriented design, WSDL and SOAP
10	Contrast the concept of service design and business process design

Modules	10 CS E41- Parallel Computing Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Describe the evolution and parallel model of computer
2	Comprehend the fundamental parallel programming concepts and the issues related to them
3	Analyze the technologies enabling parallel computing
4	Justify the concepts of cache coherence and latency
5	Differentiate types of interconnection networks
6	Describe Multithreading and Synchronization
7	Characterize different parallel programming models
8	Demonstrate shared memory programming
9	Obtain knowledge about Message Passing Paradigm and Message Passing Interface
10	Determine the performance of Parallel Virtual Machine

Modules	10 CS E42 - Text Mining Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Acquiring the basic concept of natural language processing
2	Elucidate the concept of distribution technique and its applications
3	Enriching about meaning of the words
4	Expected to understand about Indexing techniques
5	Exploring the indexing of google search engine
6	Illustrate about ranking algorithms of google
7	Narrate about text mine crawlers
8	Elucidate about the similarity measure techniques in text
9	Discuss categorization problem related to text
10	Elucidate about various categorization methods

Modules	10 CS E43 - Semantic Web Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Gain knowledge in Semantic Web and its Technologies
2	Obtain the knowledge of the layering approach of semantic Web
3	Construct the RDF data model and defining the vocabularies used in RDF data model
4	Edit, Parse and Browse RDF / XML
5	Identify the requirements of Ontology and know the sublanguages
6	Describe the On-To-Knowledge Semantic Web Architecture
7	Write the Monotonic and Non monotonic Rules
8	Inferring new knowledge from existing knowledge
9	Realize the applications of semantic web technologies
10	Examine the future of semantic web

Modules	10 CS E44 - Agile Software and Methodology Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Comprehend the software poetry and games
2	Gain the knowledge of software and engineering, model building
3	Comprehend the programmers as communication specialists
4	Gain the knowledge of open source development
5	Implement the characteristic function
6	Realize the concept of countering with discipline and tolerance
7	Realize the concept of cooperating team
8	Observe the osmotic function
9	Design the agile methodology
10	Design the principles

Modules	10 CS E45 - Software Quality Assurance Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Practice the fundamentals of SQA
2	Describe the quality management and software configuration management
3	Express about managing software organization and quality
4	Discuss the defect prevention and quality assurance management
5	Apply the software quality and total quality management techniques
6	Extend the software quality matrices and Software Quality Metrics Analysis
7	Practice the software quality program concepts
8	Summarize the Software Quality Assurance Planning
9	Prepare the software standards and software quality system standards
10	Describe about Capability Maturity Model and the Role of SQA in Software Development Maturity

Modules	10 CS E46 - Wireless Sensor Networks Course Outcomes (COs)
	At the end of the course, the student will be able to
1	Realize basics of Sensor networks
2	Acquire knowledge on the Sensor models, compression and metrics
3	Comprehend the access control and its issues
4	Realize the various routing techniques
5	Establishing the various infrastructures
6	Comprehend the Sensor tasking and its control
7	Implement the sensor network database
8	Attain knowledge on the network aggregation
9	Develop the sensor network platform and simulators
10	Comprehend the sensor network applications