COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

COIMBATORE - 641 014, TAMILNADU, INDIA

DIAMOND JUBILEE

(1956 - 2016)

Department of Computing

M.Sc. (Software Systems)

Curriculum and Syllabi

Under Choice Based Credit System

(For the students admitted during 2015 - 2016 and onwards)

INDEX

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF THE INSTITUTE

Vision

The institute strives to inculcate a sound knowledge in engineering along with realized social responsibilities to enable its students to combat the current and impending challenges faced by country and to extend their expertise to the global arena.

MISSION

The Mission of CIT is to impart high quality education and training to its students to make them world-class engineers with a foresight to the changes and problems and pioneers to offers innovative solutions to benefit the nation and the world at large.

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF DEPARTMENT OF COMPUTING

Vision

Department of Computing endeavors to make the students, world class software engineers with prudence of pioneering the solutions to the challenges of the nation and the world.

MISSION

The Mission of Department of Computing is

M1 To impart sound conceptual knowledge along with intensive practical training and real time industry/ research project exposure to the students

M2 To provide a learning ambience to enhance innovations, problem solving skills, leadership qualities, team-spirit and ethical responsibilities.

M3 To establish Industry Institute Interaction program to provide exposure of latest tools and technologies used in the IT organizations and enhance the entrepreneurship skills

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

Our Graduates will :

PEO1 **Expertise in software solution :** Work productively as highly competent software professionals with the capability of investigating the problem, planning and developing the quality software solutions for various domains.

PEO2 **Research :** Promote research in the development of leading innovative products

PEO3 **Leadership :** Inspire and guide the groups they work with in bringing their ideas to fruition, with managerial skills, self-assurance and integrity.

PEO4 **Social Responsibility :** commit to social ethical and professional responsibilities.

PEO5 **Life-long Learning :** Participate in life-long learning to enhance knowledge and skills necessary to contribute to the betterment of profession

PEO6 **Entrepreneurship :** Become Successful entrepreneurs with the strong business managerial skills.

DEPARTMENT OF COMPUTING

COIMBATORE INSTITUTE OF TECHNOLOGY

PROGRAMME OUTCOMES (POS)

Students in the M.Sc.(Software Systems) should possess the following abilities :

PO1 : Analyze a problem and design an efficient solution with the knowledge of Mathematics and Computing

PO2 : Plan, develop and manage software solutions that aid the industry or government to accomplish their set goals using state-of-the-art technology

PO3 : Design and develop the decision support system

PO4 : Design and develop internet based embedded software systems for real time environment

PO5 : Assess the quality standards of the development process and software solutions

PO6 : Communicate effectively with stakeholders and work as part of teams

PO7 : Work with professional, and ethical values

PO8 : Understand and solve legal and security issues of socio-economical applications

PO9 : Recognize the importance of research to develop leading innovative products in diversified fields of computer science

PO10 : Self learning and adaptation to the emerging technologies to address the challenging issues

PO11 : Apply the principles of management in defining, planning and tracking the projects.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. (Software Systems)

Curriculum from the Academic Year 2015 - 2016 and onwards

Semester I

Course Code	Course Name	L	T	P	C	CAT
15MSS11	Technical English	3	0	0	3	HS
15MSS12	Algebra and Calculus	3	2	0	4	BS
15MSS13	Problem Solving and Programming in C	3	2	0	4	PC
15MSS14	Basics of Information Systems	3	0	0	3	ES
15MSS15	Digital Electronics	3	0	0	3	ES
15MSS16	Programming Laboratory in C	0	0	4	2	PC
15MSS17	Digital Electronics Laboratory	0	0	4	2	ES
15MSS18	Computing Laboratory	0	0	4	2	BS
15MSS19	English Language Laboratory	0	0	2	1	HS
	TOTAL CREDITS				**24**	

Semester II

Course Code	Course Name	L	T	P	C	CAT
	Language Elective	3	0	0	3	HS
15MSS21	Probability and Statistics	3	2	0	4	BS
15MSS22	Fundamentals of Web Technology	3	0	0	3	PC
15MSS23	Data Structures and Algorithms	3	2	0	4	PC
15MSS24	Object Oriented Programming	3	0	0	3	PC
15MSS25	Data Structures and Algorithms Laboratory	0	0	4	2	PC
15MSS26	Object Oriented Programming Laboratory	0	0	4	2	PC
15MSS27	Scripting Laboratory	0	0	4	2	PC
	TOTAL CREDITS				**23**	

Semester III

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS31	Discrete Mathematical Structures	3	2	0	4	BS
15MSS32	Computer Architecture	3	0	0	3	PC
15MSS33	Operating Systems	3	0	0	3	PC
15MSS34	Advanced Data Structures and Algorithms	3	0	0	3	PC
15MSS35	Software Engineering	3	0	0	3	PC
	PRACTICALS					
15MSS36	Advanced Datastructures and Algorithms Laboratory	0	0	4	2	PC
15MSS37	Visual Programming Laboratory	0	0	4	2	PC
15MSS38	Operating Systems Laboratory	0	0	4	2	PC
15MSS49	Communication Skills & Personality Development*					EEC
	TOTAL CREDITS				**22**	

* A pass is required

Semester IV

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS41	Resource Management Techniques	3	2	0	4	BS
15MSS42	Theory of Computing	3	0	0	3	PC
15MSS43	Microprocessors and Assembly Language Programming	3	0	0	3	PC
15MSS44	Database Management Systems	3	0	0	3	PC
15MSS45	Java Programming	3	0	0	3	PC
	PRACTICALS					
15MSS46	Microprocessors Laboratory	0	0	4	2	PC
15MSS47	Database Management Systems Laboratory	0	0	4	2	PC
15MSS48	Java Programming Laboratory	0	0	4	2	PC
15MSS49	Communication Skills & Personality Development*					EEC
	TOTAL CREDITS				**22**	

* A pass is required

Semester V

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS51	Computational Intelligence	3	0	0	3	PC
15MSS52	Object Oriented Software Engineering	3	0	0	3	PC
15MSS53	Computer Networks	3	0	0	3	PC
	Elective - I	3	0	0	3	PE
	Elective - II	3	0	0	3	PE
	PRACTICALS					
15MSS54	Object Oriented Software Development Laboratory	0	0	4	2	PC
15MSS55	Network Programming Laboratory	0	0	4	2	PC
	Elective Laboratory - I	0	0	4	2	PE
	TOTAL CREDITS				**22**	

Semester VI

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS61	Software Architecture	3	0	0	3	PC
15MSS62	Mobile Computing	3	0	0	3	PC
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PC
	Elective - III	3	0	0	3	PE
	Elective- IV	3	0	0	3	PE
	PRACTICALS					
15MSS64	Mobile Application Development Laboratory	0	0	4	2	PC
15MSS65	Software Testing Laboratory	0	0	4	2	PC
	Elective Laboratory - II	0	0	4	2	PE
	TOTAL CREDITS				**23**	

Semester VII

Course Code	Course Name	L	T	P	C	CAT
15MSS71	Project Work and Viva Voce - I	0	0	0	18	EEC
	TOTAL CREDITS				**18**	

Semester VIII

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS81	Software Project Management	3	0	0	3	PC
15MSS82	Internet of Things	3	0	0	3	PC
	Elective - V	3	0	0	3	PE
	Elective - VI	3	0	0	3	PE
	Elective - VII	3	0	0	3	PE
	PRACTICALS					
15MSS83	Internet of Things Laboratory	0	0	4	2	PC
	Elective Laboratory - III	0	0	4	2	PE
	Elective Laboratory - IV	0	0	4	2	PE
	TOTAL CREDITS				**21**	

Semester IX

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS91	Information Security	3	0	0	3	PC
15MSS92	Professional Ethics	3	0	0	3	EEC
	Elective - VIII	3	0	0	3	PE
	Elective - IX	3	0	0	3	PE
	Elective - X	3	0	0	3	PE
	PRACTICALS					
15MSS93	Information Security Laboratory	0	0	4	2	PC
	Elective Laboratory - V	0	0	4	2	PE
	Elective Laboratory - VI	0	0	4	2	PE
	TOTAL CREDITS				**21**	

Semester X

Course Code	Course Name	L	T	P	C	CAT
15MSS101	Project Work and Viva Voce - II	0	0	0	18	EEC
	TOTAL CREDITS				**18**	
	GRAND TOTAL OF CREDITS				**215**	

PROFESSIONAL ELECTIVES

Course Code	Course Name	L	T	P	C	CAT
	GENERAL STREAM					
15MSSE01	Software User Interface Design	3	0	0	3	PE
15MSSE02	Software Language Engineering	3	0	0	3	PE
15MSSE03	Enterprise Application Development	3	0	0	3	PE
15MSSE04	Data Centric Computing	3	0	0	3	PE
15MSSE05	Agile Process Models	3	0	0	3	PE
15MSSE06	Software Requirements Engineering	3	0	0	3	PE
15MSSE07	Software Reliability	3	0	0	3	PE
15MSSE08	Open Source Software Development	3	0	0	3	PE
15MSSE09	Graphics and Multimedia Technologies	3	0	0	3	PE
15MSSE10	IT infrastructure Management	3	0	0	3	PE
15MSSE11	Bio-Informatics	3	0	0	3	PE
15MSSE12	Accounting and Financial Management	3	0	0	3	PE
15MSSE13	Geographic Information System	3	0	0	3	PE
15MSSE14	Design Thinking	3	0	0	3	PE
15MSSE15	Business Process Management	3	0	0	3	PE
15MSSE16	Human Resource Management	3	0	0	3	PE
	DISTRIBUTED AND NETWORKED SYSTEMS STREAM					
15MSSE17	Internetworking Protocols	3	0	0	3	PE
15MSSE18	Distributed Computing	3	0	0	3	PE
15MSSE19	SOA and Web Services	3	0	0	3	PE
15MSSE20	Cloud Computing	3	0	0	3	PE
15MSSE21	Parallel Computing	3	0	0	3	PE
15MSSE22	Software Defined Networks	3	0	0	3	PE
15MSSE23	Autonomic Computing	3	0	0	3	PE
	EMBEDDED AND AUTONOMOUS SYSTEM STREAM					
15MSSE24	Real Time Systems	3	0	0	3	PE
15MSSE25	Analysis and Design of Real Time Systems	3	0	0	3	PE
15MSSE26	Embedded Processors	3	0	0	3	PE
15MSSE27	Computer vision	3	0	0	3	PE
15MSSE28	Sensing and Sensors	3	0	0	3	PE
15MSSE29	Mechanics of Robotic manipulation	3	0	0	3	PE
	DATA ANALYTICS STREAM					
15MSSE30	Advanced Database Concepts	3	0	0	3	PE
15MSSE31	Data Mining	3	0	0	3	PE
15MSSE32	Big Data Analytics	3	0	0	3	PE
15MSSE33	Business Intelligence	3	0	0	3	PE
15MSSE34	Machine Learning	3	0	0	3	PE

PROFESSIONAL ELECTIVE - LABORATORIES

Course Code	Course Name	L	T	P	C	CAT
	GENERAL STREAM					
15MSSL01	Software Language Engineering Laboratory	0	0	4	2	PE
15MSSL02	Enterprise Application Development Laboratory	0	0	4	2	PE
15MSSL03	Graphics and Multimedia Laboratory	0	0	4	2	PE
15MSSL04	Accounting Software Laboratory	0	0	4	2	PE
	DISTRIBUTED AND NETWORKED SYSTEMS					
15MSSL05	Web Services Laboratory	0	0	4	2	PE
15MSSL06	Cloud Computing Laboratory	0	0	4	2	PE
15MSSL07	Parallel Computing Laboratory	0	0	4	2	PE
	EMBEDDED AND AUTONOMOUS SYSTEMS					
15MSSL08	Image Processing Laboratory	0	0	4	2	PE
15MSSL09	Real-Time Embedded System Laboratory	0	0	4	2	PE
	DATA ANALYTICS					
15MSSL10	Business Intelligence Laboratory	0	0	4	2	PE
15MSSL11	Data Mining Laboratory	0	0	4	2	PE
15MSSL12	Big Data Analytics Laboratory	0	0	4	2	PE

LANGUAGE ELECTIVES

Course Code	Course Name	L	T	P	C	CAT
15MSSLE01	Professional English	3	0	0	3	HS
15FY22F	Basic French	3	0	0	3	HS
15FY22G	Basic German	3	0	0	3	HS

HUMANTIES AND SOCIAL SCIENCES

Course Code	Course Name	L	T	P	C	CAT
15MSS11	Technical English	3	0	0	3	HS
15MSS19	English Language Laboratory	0	0	2	1	HS
	Language Elective	0	0	0	3	HS

BASIC SCIENCES

Course Code	Course Name	L	T	P	C	CAT
15MSS12	Algebra and Calculus	3	2	0	4	BS
15MSS18	Computing Lab	0	0	4	2	BS
15MSS21	Probability and Statistics	3	0	2	4	BS
15MSS31	Discrete Mathematical Structures	3	2	0	4	BS
15MSS41	Resource Management Techniques	3	2	0	4	BS

ENGINEERING SCIENCE

Course Code	Course Name	L	T	P	C	CAT
15MSS14	Basics of Information Systems	3	0	0	3	ES
15MSS15	Digital Electronics	3	0	0	3	ES
15MSS17	Digital Electronics Laboratory	0	0	4	2	ES

PROFESSIONAL CORE

Course Code	Course Name	L	T	P	C	CAT
	THEORY					
15MSS13	Problem Solving and Programming in C	3	2	0	4	PC
15MSS22	Fundamentals of Web Technology	3	0	0	3	PC
15MSS23	Data Structures and Algorithms	3	2	0	4	PC
15MSS24	Object Oriented Programming	3	0	0	3	PC
15MSS32	Computer Architecture	3	0	0	3	PC
15MSS33	Operating Systems	3	0	0	3	PC
15MSS34	Advanced Data Structures and Algorithms	3	0	0	3	PC
15MSS35	Software Engineering	3	0	0	3	PC
15MSS42	Theory of Computing	3	0	0	3	PC
15MSS43	Microprocessors and Assembly Language Programming	3	0	0	3	PC
15MSS44	Database Management Systems	3	0	0	3	PC
15MSS45	Java Programming	3	0	0	3	PC
15MSS51	Computational Intelligence	3	0	0	3	PC
15MSS52	Object Oriented Software Engineering	3	0	0	3	PC
15MSS53	Computer Networks	3	0	0	3	PC
15MSS61	Software Architecture	3	0	0	3	PC
15MSS62	Mobile Computing	3	0	0	3	PC
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PC
15MSS81	Software Project Management					
15MSS82	Internet of Things	3	0	0	3	PC
15MSS91	Information Security	3	0	0	3	PC
	PRACTICALS					
15MSS16	Programming Laboratory in C	0	0	4	2	PC
15MSS25	Data Structures and Algorithms Lab	0	0	4	2	PC
15MSS26	Object Oriented Programming Lab	0	0	4	2	PC
15MSS27	Scripting Laboratory	0	0	4	2	PC
15MSS36	Advanced Datastructures and Algorithms Laboratory	0	0	4	2	PC
15MSS37	Visual Programming Laboratory	0	0	4	2	PC
15MSS38	Operating Systems Laboratory	0	0	4	2	PC

Course Code	Course Name	L	T	P	C	CAT
15MSS46	Microprocessors Laboratory	0	0	4	2	PC
15MSS47	Database Management Systems Laboratory	0	0	4	2	PC
15MSS48	Java Programming Laboratory	0	0	4	2	PC
15MSS54	Object Oriented Software Development Laboratory	0	0	4	2	PC
15MSS55	Network Programming Laboratory	0	0	4	2	PC
15MSS64	Mobile Application Development Laboratory	0	0	4	2	PC
15MSS65	Software Testing Laboratory	0	0	4	2	PC
15MSS83	Internet of Things Laboratory	0	0	4	2	PC
15MSS93	Information Security Laboratory	0	0	4	2	PC

EMPLOYABILITY ENHANCEMENT COURSE

Course Code	Course Name	L	T	P	C	CAT
15MSS49	Communication Skills & Personality Development*					EEC
15MSS71	Project Work and Viva Voce - I	0	0	0	18	EEC
15MSS92	Professional Ethics	3	0	0	3	EEC
15MSS101	Project Work and Viva Voce - II	0	0	0	18	EEC

CAT - Category, BS - Basic Sciences, HS - Humanities and Social Sciences,

ES - Engineering Sciences, PC - Professional Core, PE - Professional Elective,

EEC - Employability Enhancement Course, MC - Mandatory Course

15MSS11 -TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a technical paragraph, identify the topic sentence, infer meanings, lexical and contextual items, and find the supporting points and transitional tags.*
- *Given a communication context specify the barriers to listening and deduce solutions to overcome the barriers.*
- *For a given topic, introduce ideas, give opinions and justify your stance. For a given topic, argue for or against the topic for 5 minutes.*
- *For a given topic, write an argumentative, descriptive, biographical or autobiographical essay. Interpret the given technical graphical representation and compose passage. Summarise and paraphrase technical texts in about 200 to 300 words.*
- *Apply the rules of grammar viz, tenses, prepositions, subject-verb agreement adjectives and adverbs direct indirect speech and use appropriate patterns in a given sentence.*

FOCUS ON LANGUAGE

Synonyms - Antonyms - Forms of Words - One Word Substitutes - Word Formation - Contextual Meanings - Tenses - Prepositions - Subject-verb Agreement - Adjectives - Sequence Words - Wh-Questions - Direct Indirect Speech- Adverbs - Abbreviations and Acronyms. **(9)**

READING

Predicting the Content - Skimming the Text - Understanding the Gist -Topic Sentence and its Role - Scanning - Inferring Meanings: Lexical and Contextual - Note-Making - Interpreting Graphics in Technical Writing - Sequencing of Sentences - Reading Comprehension - Dictionary Skills - Itinerary **(9)**

WRITING

Filling Forms - Descriptive Writing - Autobiographical & Biographical Writing - Paragraph Writing - Academic Writing - Tweets - Paraphrasing - Channel Conversion - Essay Writing: Argumentative Writing - Poster Making - Recommendations - Dialogue Writing - Informal Letters **(9)**

LISTENING

Importance of Listening & Empathy in Communication - Reasons for Poor Listening - Traits of a Good Listener - Listening Mode - Note Taking - Listening to Short Dialogues - Listening to Long Conversations. **(8)**

SPEAKING

Describing Places - Giving Opinions - Narration - Introducing Ideas - Justifying Opinions - Formal Conversations - Telephonic Skill - Debating - Apologizing - Extempore - Effective Presentation Strategies - Planning - Outlining & Structuring - Nuances of Delivery - Controlling Nervousness & Stage Fright - Visual Aids in Presentation - Applications of MS Power Point. **(10)**

TOTAL : 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

EXTENSIVE READING

2. *Dr.A.P.J.Abdul Kalam "India 2020" - Vision for the Millennium - Brooks/Cole Publishing Company, 2002. (Only Essay Questions)*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Nagaraj Geetha, "A Course in Grammar and Composition", Cambridge University Press, 2012*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
5. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*
6. *Simon Sweeney, "English for Business Communication", Cambridge University Press, 2010.*

15MSS12 - ALGEBRA AND CALCULUS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To practice linear transformations, and to find its rank, basis and dimensions.*
- *To compute the inverse and higher powers of a non singular matrix of order three using Cayley-Hamilton Theorem. To convert the quadratic form of 3 unknowns in to canonical form. Also to discuss eigenvalue problems with applications.*
- *To solve algebraic equations using Newton Raphson method and Graeff's root squaring method. To solve linear system of equations using direct and indirect method with applications.*
- *To expand the function of two variables by using Taylor series. To determine the radius of curvature, evolute and envelope of a given plane curve. To practice multiple integrals and their applications in area and volume.*
- *To apply standard methods for curve fitting, interpolation, differentiation and integration for a given discrete data base using standard methods.*

ALGEBRA

VECTOR SPACES

Linear dependence and independence of vectors- dimension, basis - rank of a matrix - linear transformation. **(5)**

MATRICES

Eigenvalues and Eigenvectors - Cayley Hamilton theorem (without proof)- Application to find the inverse and higher powers of a matrix - Diagonalisation - Quadratic forms - Orthogonal reduction to Canonical form.

Applications of Eigenvalue problems: Stretching of an elastic membrane. **(11)**

SOLUTION OF EQUATIONS

Algebraic and transcendental equations - Newton Raphson method. Polynomial equations - Grafae's root squaring method.

Linear System of Equations: Gauss elimination, Gauss Jordan Method- Inverse of a matrix - Gauss Seidal iteration method.

Applications of Linear systems: A homogenous system in economics - non-homogenous system by matrix inversion. **(9)**

CALCULUS

Differential Calculus: Curvature - Envelopes - Evolutes, Functions of two variables - Expansions and extreme values.

Integral Calculus: Double and triple integrals - changing the order of integration. Applications: Area - Volume. **(12)**

EXPERIMENTAL DATA ANALYSIS

Curve fitting: Least Square Method

Interpolation : Newton's method - Lagrange's method

Numerical Differentiation : Application to Maxima and Minima of functions.

Numerical Integration : Trapezoidal rule- Simpson's 1/3rd rule. Applications to area, volume and linear motion.

Numerical Solutions of Ordinary Differential Equations: Taylor's Series - Runge Kutta Fourth order methods - Milne's Predictor - Corrector Method. **(8)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Kandasamy, P.et al., "Engineering Mathematics", Volume - I & II (8th Fully Revised Edition), "S. Chand & Co, 2008.*
2. *Kandasamy .P et al., "Numerical Methods", (for first year), (First Revised Edition) Tata McGraw Hill Publishing company Ltd., 2008.(para 5)*
3. *Veerarajan T, "Engineering Mathematics (For First Year)", (first revised edition), Tata McGraw Hill Publishing company Ltd , 2008.*
4. *Venkataraman. M.K., "Engineering Mathematics", (First year), The National Publishing Company,2008.*
5. *David C Lay "Linear Algebra and its Applications", Fourth edition Pearson 2012*

REFERENCE BOOKS

1. *Erwin Kryszig, "Advanced Engineering Mathematics", 8th Edition John Wiley & Sons (Asia) Pvt. Ltd., 2008.*
2. *Grewal, B.S., "Higher Engineering Mathematics", (40th Edition), Khanna Publishers, 2007.*

15MSS13 - PROBLEM SOLVING AND PROGRAMMING IN C

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the role of computers and programming languages in solving the real world problems.*
- *Analyze the given problem statement and develop an algorithm with the properties of finiteness, completeness and correctness*
- *Use the suitable data type among Arrays, Pointers, Strings, Structure, Union and Files to store and manipulate data*
- *Analyze the given problem statement, divide it into modules and represent them using functions in C*
- *Develop a C program for a given problem statement by using the necessary program structure, data types and constructs to generate the correct output*

INTRODUCTION TO PROBLEM SOLVING

Algorithms: Definition, Pseudocode conventions, program development - program analysis. **(6)**

BASIC CONSTRUCTS

Introductory Concepts - Introduction to C programming - Operators and Expressions - Data Input and Output - Control Statements - Macros. **(6)**

FUNCTIONS AND STORAGE CLASSES

Overview - Defining and Accessing a Function - Prototypes - Passing Arguments - Recursion.

Storage classes - Automatic, External and Static Variables - Multifile Programs. **(8)**

ARRAYS, STRINGS AND POINTERS

Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays.

Defining a String - Null Character - Initialization - Reading and Writing - Processing - Character Arithmetic - Searching and Sorting.

Pointer Fundamentals - Declarations - Passing Pointers - Pointers and Arrays -Dynamic Memory Allocation - Operations on Pointers - Arrays of Pointers. **(4+4+6)**

STRUCTURES AND UNIONS, FILE HANDLING

Defining and Processing Structures - Typedef - Structures and Pointers - Passing Structures to Functions - Unions.

Data File Handling - Binary File Handling - Random Access. **(5+6)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Ellis Horowitz, Sartaj Sahni "Fundamentals of Data Structures", Galgotia Publications, 2003.*
2. *Schaum's outline series, "Programming with C", Tata McGraw Hill Publication, 2nd Edition, 2010.*

REFERENCE BOOKS

1. *Herbert Schildt, "C- The Complete Reference", McGraw Hill, 4th edition, 2009.*
2. *Yashavant P. Kanetkar, "Let Us C", BPB Publications, 13th Edition, 2012.*
3. *R.G. Dromey, "How to solve it by Computer", Prentice Hall of India, 8th Edition, 2003.*
4. *Kernighan B.W. and Ritchie D.M., "C Programming Language (ANSI C)", Pearson Education, 2004*
5. *Herbert Schildt, Jean Paul Tremblay, Richard B Bunt, "Introduction to Computer Science - An Algorithmic Approach", McGraw Hill, 2nd Edition, 1985.*
6. *Terrence W Pratt, "Programming language - Design and Implementation", Prentice Hall of India, 4th Edition, 2001.*

15MSS14 - BASICS OF INFORMATION SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an organizational workflow, describe the various information systems used and indicate their unique functionalities*
- *Apply the knowledge of various hardware and software constituents of a computer system and indicate the hardware and software requirements for a home PC, a small business like a shop, an educational institution and a large business organization.*
- *Given a software project identify the data requirements and organize data in the form of a database using relational model, within the scope of the project*
- *Demonstrate the five phases of the system development life cycle and identify the major activities to be carried out in each phase, for a given information systems development project*
- *Analyse the impact of the Internet and distributed processing technology on business electronic commerce and mobile commerce*

INTRODUCTION TO INFORMATION SYSTEMS

Information concepts - System concepts - Information System definition - Business Information Systems - Organizations and Information Systems - Careers in Information Systems - Case study **(8)**

INFORMATION TECHNOLOGY

Hardware : Computer Systems - Processing and Memory devices - Secondary storage - Input and Output devices.

Software : An overview - Systems Software - Application Software - Programming Language - Software issues and trends. **(8)**

ORGANIZING DATA AND INFORMATION

Data Management - Data Modeling and Relational Database Model - Database Management Systems - Database Applications **(10)**

SYSTEMS DEVELOPMENT

Overview of Systems Development - Systems Development Life cycle - Systems Investigation - Systems Analysis - Systems Designs - Systems Information - Systems Operation and Maintenance. **(8)**

NETWORKS AND DISTRIBUTED PROCESSING

Functionality of the Internet - The World Wide Web - Internet and Web Application -Introduction to Electronic Commerce - Introduction to Mobile Commerce - Enterprise Systems : Overview of ERP, SCM, CRM - Overview of MIS - Overview of AI - Overview of Expert Systems. **(11)**

TOTAL : 45

TEXT BOOK

1. *Ralph M. Stair and George N. Reynolds, "Principles of Information Systems - A Managerial Edition", Eighth Edition, Thomson India Edition 2007.*

REFERENCE BOOKS

1. *James A. O' Brier, "Introduction to Information Systems", Tata McGraw - Hill Publishers Twelfth Edition, 2005.*
2. *S.A. Kelbar, "Information Systems - A Concise Study", PHI Learning, 2009.*

15MSS15 - DIGITAL ELECTRONICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Perform arithmetic operation on the various number systems and conversions among them.*
- *Design logic circuits using logic gates for a given problem.*
- *Apply Boolean algebra to solve logic functions.*
- *Identify, analyze and design simple combinational circuits.*
- *Design simple synchronous and asynchronous sequential circuits.*

NUMBER SYSTEMS AND CODES

Decimal, Binary, Octal and Hexadecimal Systems - Number base conversions-BCD (8421) code - Gray code and conversion- ASCII code - Error detecting and correcting codes: parity bit, block parity, Hamming code. **(8)**

BINARY ADDITION AND SUBTRACTION

1's, 2's, 9's, 10's, 15's, 16's Complement representation - 1's and 2's Complement subtraction - unsigned and signed numbers - BCD addition - 9's and 10's BCD subtraction - Binary Multiplication and Division **(8)**

BOOLEAN ALGEBRA AND LOGIC GATES

Laws of Boolean algebra - Basic theorem and properties - Boolean expression and function - Canonical and Standard forms - Minimization of Boolean expression - Karnaugh Map and Quine Mc-Cluskey Method - Basic logic gates and truth tables - universal gates implementation. **(10)**

COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS

Combinational logic: Half Adder and Full Adder, Half Subtractor and Full Subtractor -Encoder and Decoder - Multiplexer and Demultiplexer.

Sequential logic: Latches and FlipFlops - Clocked RS, JK, T and D Flip-Flops. **(10)**

COUNTERS AND REGISTERS

Asynchronous and Synchronous : Up counter and Down counter - Mod 5, Mod 10 counters - Parallel / Serial In / Out Shift Registers - Ring Counter. **(9)**

TOTAL : 45

TEXT BOOK

1. *A.P.Godse and Dr. D.A. Godse, "Digital Electronics", Technical Publications, Pune, 2008.*

REFERENCE BOOKS

1. *Morris Mano.M., "Digital Logic and Computer Design", PHI, 2001.*
2. *Malvino PA and Leach BP, "Digital Principles and Applications", McGraw Hill Book Company, 5th Edition, 1994*
3. *Thomas C Bartee, "Digital Computer Fundamentals", McGraw Hill Book Company, 6th Edition, 1997.*
4. *Thomas L Floyd, "Digital Fundamentals", UBS, 10th Edition, 2008.*

15MSS16 - PROGRAMMING LABORATORY IN C

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Solve the given problem by devising an algorithm and converting it into C program*
- *Develop C programs with necessary data types to represent the data and manipulate them using appropriate operators and built-in functions*
- *Develop C programs with appropriate control structures to implement decision making*
- *Develop reusable and efficient solutions using functions and/or recursive functions in C*
- *Develop C programs to create and access the files for handling the persistent data*
- *Develop a simple project in application or system domain using C*

CONCEPTS TO BE COVERED

1. Simple programs to understand the concepts of data types.
2. Writing programs to get familiarity on using conditional, control and repetition statements.
3. Defining and creating one and two dimensional arrays- Matrix operations
4. Solving Systems of Linear Equations
5. Working with pointers.
6. Functions - call by value and call by reference
7. String manipulations.
8. Solving Recursive problems
9. Solving iterative problems - Trigonometric series evaluation.
10. Use dynamic memory allocation functions for storage allocation.
11. Defining and handling structures, array of structures, structure pointers, union and enumeration type.
12. Defining functions with structure.
13. Application Programs using file operations.

15MSS17 - DIGITAL ELECTRONICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To emulate and understand the internal working of arithmetical, relational and logical circuits inside computer systems.*
- *To familiarize digital data processing and storage through combinational and sequential logic*
- *To Demonstrate serial and parallel data operations using shift registers and counters*
- *To comply data encryption and decryption methods using encoding and decoding*
- *To implement low level to high level digital computer systems using combinational and sequential logic*

CONCEPTS TO BE COVERED

1. Study of logic gates
2. Study of Flip-Flops
3. Design of binary counter & decade counter
4. Construction of Half-adder & Full-adder
5. Implementation of basic Logic gates using Universal gates.
6. Testing Left shift, Right shift and Parallel-In, Parallel-Out operation of the Shift registers.
7. Multiplexing and Demultiplexing.
8. Encoding and decoding
9. Conversion of binary into gray and gray into binary.

15MSS18 - COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Compute Arithmetic and logical calculations and create graphical charts using EXCEL*
- *Manipulate files using appropriate UNIX filter commands such as sort, cut, find, uniq, cmp, comm, wc and grep for a given scenario.*
- *Use command line arguments and interactive inputs for implementing shell scripts in a Linux environment.*
- *Solve linear equations to solve for unknowns using MATLAB tool.*
- *Perform various operations on matrices using MATLAB tool.*

CONCEPTS TO BE COVERED

1. Introducing the features of EXCEL.
2. Arranging and formatting the set of elements using EXCEL.
3. Performing simple arithmetic and logical calculations using EXCEL.
4. Creating graphical charts using EXCEL.
5. Working with vi Editor in UNIX.
6. Learn the use of basic UNIX commands.
7. Learn the use of redirection and File access permissions.
8. Working with filters.
9. Working with commands such as find, cmp, comm, uniq.
10. Simple Shell Programs.
11. Solving numerical problems using MATLAB tool.
12. Solving linear equations using MATLAB tool.
13. Solving matrices using MATLAB tool.

15MSS19 - ENGLISH LANGUAGE LABORATORY

L	T	P	C
0	0	2	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *For a given 2 to5 minutes speaking activity like Extempore and Debate, produce language structures accurately and fluently.*
- *Construct dialogues for a given social scenario and interpret the given graphic information and write creative paragraphs.*
- *For a given technical topic, prepare a power point presentation for 15 minutes.*
- *Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *Given a technical paragraph for reading, specify correct responses by identifying the topic sentence, inferring meanings, lexical and contextual items, and finding the supporting points and transitional tags.*

LIST OF EXPERIMENTS

1. Speech Sounds
2. Word Vocabulary
3. Reading Comprehension
4. Listening Practice - I
5. Dialogue Writing
6. Conversational Exercise - I
7. Focus on Language
8. Creative Writing
9. Conversational exercise - II
10. Listening Practice-II

15MSSLE01 - PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the rules of the grammar viz, Confusing words, Verbs, Gerunds, Infinitives, Cause and Effect and use appropriate patterns in a given sentence or a passage.*
- *Given a passage or a technical topic, prepare a mind map, make notes and summarize.*
- *Given a Business Communication scenario, prepare Reports, Memos, Instructions, Minutes of the meeting, Emails and Business letters using appropriate format.*
- *Given a communication context, specify the type and barrier to listening, provide solutions and justify. Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *For a given HR topic, generate valid points for and against the topic and present them with group behavior. For any job requirement, plan and prepare a 20 minute Mock Interview.*

FOCUS ON LANGUAGE

Scientific Terminology - Homonyms - Homophones - Formal Vocabulary - Confusing Words - Idiomatic Expressions - Collocations - Regular and Irregular Verbs - Gerund - Voice - Infinitive - Modal Verbs - Phrasal Verbs - If Conditionals - Cause and Effect - Numerical Adjectival Phrases - Conjunctions - Clauses - Definitions - SMS Language. **(11)**

READING

Summarizing - SQ3R Reading Technique - Note Making: Outline/Linear Method- Sentence Method - Schematic Method - Understanding Discourse Coherence - Non-Verbal Signals - Cloze Comprehension - Mind Mapping. **(7)**

WRITING

Business Letters - Article Writing - Review of a Newspaper Report - Emails - Report Writing - Instructions - Vacancy Advertisements - Resume - Meetings: Agenda and Minutes of the Meeting - Writing Book Reviews - Memorandum - Essay Writing. **(11)**

LISTENING

Types of Listening- Barriers to Effective Listening- Intensive Listening - Listening to Podcast, Negotiation, Job Interviews, Group Discussions and Filling Gaps. **(7)**

SPEAKING

Interviews: Objectives of Interviews - Types of Interviews - Group Discussions - Organizational GD - GD as a Part of Selection Process - Role Play - Negotiation. **(9)**

TOTAL : 45

TEXT BOOK

1. *Dr.K.Elango, "Resonance", Cambridge University Press, New Delhi, 2013.*

REFERENCE BOOKS

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2012.*
2. *Nagaraj Geetha, "A Course in Grammar and composition", Cambridge University Press, 2012*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.*
5. *B. Sai Lakshmi. "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

15FY22F - BASIC FRENCH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of the semester the students will:

- *Use the basics of the Language in Social contexts.*
- *Write simple narration, description and speak to communicate ideas.*
- *Demonstrate confidence in Social Interactions.*

INTRODUCTION **(2)**

UNITÉ-1

Faire connaissance - inviter et répondre à une invitation - décrire les personnes- articles définis et indéfinis - genre etnombre des noms et des adjectifs- interrogation et négation - conjugaison du présent. Paris monuments et lieux publics - la vie de quatre parisiens de professions différentes. **(11)**

UNITÉ-2

Exprimer l' ordre et l'obligation demander et commander - evaluer et apprécier- féliciter et remercier - articles partitifs -adjectifs démonstratifs et possessifs prépositions et adverbes de quantité et de l'imperatif verbes pronominaux - une région deFrance la Bourgogne - vie quotidienne à la compagne. **(11)**

UNITÉ-3

Raconter et rapporter - donner son avis - se plaindre et réprimander - expliquer et justifier - pronoms compléments -futur proche - passé composé et imparfait. Plusieurs régions de France - différents univers sociaux. **(11)**

UNITÉ-4

Demander l'autorisation - interdire - formuler des projects - discuter et débattre. Pronoms < en > et < y > - pronoms relatifs et superlatifs - conjugaison du futur - présent continu et passé récent.La vie administrative et régionale - problems economiques et écologiques - traditions et modernité. **(10)**

TOTAL : 45

TEXT BOOK

1. *Le Nouveau Sans Frontières - Philippe Dominique, Jacky Girardet Michèle Verdelhan, Michel Verdelhan.*

REFERENCE BOOKS

1. *Dondo Modern French Course ---Mathurin Dondo*
2. *Modern French Grammar---Margaret Lang and Isabelle Perez.*

15FY22G - BASIC GERMAN

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

At the end of the semester the students will:

- *Use the fundamental concepts of the Language in social contexts.*
- *Write simple narration, description and speak to communicate ideas.*
- *Demonstrate confidence in Social Interactions.*

EINFUHRUNG

BegrU ung - Name - Vorname - Familienname - Anrede **(7)**

THEMA

Hallo ! Wie geht's?

Begegnungen

Guten Tag, ich suche…,

Im Supermarkt

Arbeit und Freizeit

Familie und Haushalt **(10)**

GRAMMATIK-I

Position des Verbs : Aussage, W - Frage und

Ja/Nein - Frage; Artikel die der das.

W - Frage; Konjugation in Prasens;

Nominativ : bestimmter, unbestimmter und negative Artikel

Akkusativ : unbestimmterundnegativer Artikel

Adjektive : Akkusativ-Erganzung **(18)**

GRAMMATIK-II

Artikel als Pronomen Dative - Erganzung : Personalpronomen und Ortsangaben; Imperativ Modalverben; Ortsangaben; Richtungsangaben; Zeitangaben; Ordinalzahlen Possessiv - Artikel; trennbare und nicht trennbareVerben; Wechselprapositionen. **(10)**

TOTAL : 45

TEXT BOOK

Studio d A1: Kurs - und Ubungsbuch (Deutsch alsFremdsprache) CornelsenVerlag.

REFERENCE BOOK

Tangarmaktuell1 : Kursbuch + Arbeitsbuch (Deutsch alsFremdsprache) Max HueberVerlag.

15MSS21 - PROBABILITY AND STATISTICS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To describe random variables, distributions and their properties.*
- *To analyze two dimensional random variables and the study of correlation and regression between them.*
- *To analyze the sampling theory using various tests of hypothesis.*
- *To describe ANOVA and experimental designs.*
- *To describe concepts of reliability of systems and to construct control charts for various statistical problems.*

RANDOM VARIABLES

Discrete and continuous random variables - Properties- Moments - Moment generating functions and their properties. Binomial, Poisson, Geometric, Negative binomial, Uniform, Exponential, Gamma, and Weibull distributions. **(9)**

TWO DIMENSIONAL RANDOM VARIABLES

Joint distributions - Marginal and conditional distributions - Covariance - Correlation and Regression - function of a random variable-Transformation of random variables - Central limit theorem. **(9)**

TESTING OF HYPOTHESIS

Sampling distributions - Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit. **(9)**

DESIGN OF EXPERIMENTS

Analysis of variance - One way classification - CRD - Two - way classification - RBD - Latin square. **(9)**

RELIABILTY AND QUALITY CONTROL

Concepts of reliability-hazard functions-Reliability of series and parallel systems- control charts for measurements (x and R charts) - control charts for attributes (p, c and np charts) Note : Use of approved statistical table is permitted in the examination. **(9)**

TOTAL : 45+30=75

TEXT BOOKS

1. *J. S. Milton and J.C. Arnold, " Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007. (For para 1 and 2)*
2. *R.A. Johnson and C.B. Gupta, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007)*

REFERENCE BOOKS

1. *Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.*
2. *Navidi, W, "Statistics for Engineers and Scientists", Special Indian Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008.*
3. *Spiegel, M.R, Schiller, J and Alu Srinivasan, R, "Schaum's Outlines Probability and Statistics", Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2007.*

15MSS22 - FUNDAMENTALS OF WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the need for Internet Platform and its benefits over other technologies*
- *Demonstrate techniques for improving the accessibility of an HTML and XHTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms with CSS properties*
- *Employ Java Script for client side programming that uses a regular expression to validate form entry and processing*
- *Develop XML applications with DTD and style sheets that span various enterprises including Government, Industry, Academia and Society*
- *Establish PHP server side programming skills to work with form data, regular expressions, exception handling, validate data, cookies, sessions and to build interactive, data-driven sites*

INTRODUCTION

History of Internet : need for internet - W3C - Internet Languages - Browser Features - Internet Accounts - shell, PPP, SLIP - Web Server: Http Request Types - Accessing the server - Server Architecture - Client and Server side Scripting - server type - Requesting document under web.

HTML

Document Structure : Basic Tags - contents of header section - page formatting tags, text formatting tags - frames - tables - lists - image - Anchors - Forms - Hidden data in forms. **(9)**

XHTML AND CSS

XHTML Definition, Specifications, difference between HTML and XHTML - image maps - Meta elements. CSS: Web Typography - Page elements - Links and Navigation - Lists - Forms - Tables - Page Layouts - Box format - positioning - filters and alpha properties **(8)**

JAVA SCRIPT & DHTML

Introduction- Memory Concepts, Arithmetic, Decision Making, Control Structures - Functions - Arrays - Objects - Math, String, Date, Boolean and Number. DHTML - Object Model and Collections - Event Models. **(10)**

XML

Introduction - File Structure - XML Namespaces - XML Document Type Definition - XML Schema - need for schema - W3C Schema Documents - XML Vocabularies - Math ML - CML - Extended Style sheet. Parsers - DOM and SAX parsers. **(8)**

PHP

Introduction - Working with Strings, Numbers, Date and Time, Arrays. Php Functions and classes, HTML and Web pages, Forms, Sessions and Cookies, Form Input validation using Regular Expressions - Handling Databases. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", 5th edition, Pearson Education, 2011. (Para I - IV)*
2. *Vikram Vaswani "PHP Programming Solutions", Tata McGraw-Hill 2007(Para V).*

REFERENCE BOOKS

1. *Christopher Schmitt, "CSS Cookbook", Third Edition, 2009.*
2. *Paul Deitel, Harvey Deital, "JAVA How To Program" 9th Edition Pearson Education, 2011.*
3. *William R. Stanek, James O'Neill, Jeffrey Rosen, "Microsoft® PowerShell, VBScript, and JScript® Bible" Copyright © 2009 by Wiley Publishing, Inc.*

15MSS23 - DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	2	0	4

PRE-REQUISITES

15MSS13

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design and implement abstract data types such as array, linked list, stack, queue, and tree to solve real world problems.*
- *Select and use suitable data structures for problem solving and programming*
- *Design substantial and complex data structures for a given real-life problem*
- *Evaluate algorithms and data structures in terms of time and space complexity of basic operations*
- *Compare and evaluate the searching and sorting techniques based on complexity measures*

INTRODUCTION TO DATA STRUCTURES

Primitive data structures - ADT

Arrays : Arrays as ADT, one dimensional array, two dimensional array, multidimensional array, representation. **(6)**

STACK

Definition - stack as ADT - sequential representation - operations, Applications: conversion & evaluation of expression.

Recursion : Definition, properties, examples, writing recursive program.

QUEUE

Definition - queue as ADT, sequential representation - operations - circular queue - priority queue. **(11)**

LINKED LISTS

Definition - operations - linked representation of stacks & queue - circular lists - operations - doubly linked list - Application: addition of polynomial. **(9)**

TREES

Terminologies - binary tree: operations, traversals, representation - threaded binary tree - properties. **(6)**

ALGORITHMS

Analysis: Algorithms: Algorithms as a technology, Insertions Sort, Analyzing algorithms, Designing algorithms - Growth of functions.

SORTING & SEARCHING

Bubble sort - quick sort - heap sort - radix sort - Searching: linear search, binary search. **(13)**

TOTAL : 45+30 =75

TEXT BOOKS

1. *Yedidyah Langsam, Moshe.J.Augenstein, Aaron.M.Tenenbaum, "Data structures using C & C++" Second Edition, PHI Publications.(para1 to para 4)*
2. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein, "Introduction to Algorithms", Second Edition, PHI Publications, 2004.*

REFERENCE BOOKS

1. *Ellis Horowitz & Sartaj Sahni "Fundamentals of Data Structures", Galgotia Publications.*
2. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudocode Approach with C", 2002 Edition, Thomson Asia Pvt Ltd.*
3. *Krishnamoorthy.R,"Data Structures using C", Mc Graw-Hill Education (India) Pvt.Ltd, 2010.*

15MSS24 - OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13

ASSESSMENT : THEORY

COURSE OUTCOME

- *For a given scenario compare and criticize alternate implementations using functional programming and object oriented programming in view of privacy.*
- *Compare and contrast function overloading and default argument function for appropriate usage in an object oriented system.*
- *For a given scenario, construct an object oriented system using appropriate type of inheritance for realizing reusability.*
- *Construct and compare object oriented systems using static binding, dynamic binding and template classes for realizing polymorphism.*
- *Create persistent objects using stream class hierarchy incorporating exceptional handling.*

INTRODUCTION

Introduction to C++ - Programming Paradigms - Procedural Programming - Modularity - Separate compilation - Exception Handling - Data Abstraction- User Defined Types - Concrete Types - Abstract Types - Virtual Function - Object Oriented Programming - Generic Programming **(6)**

BASIC FACILITIES IN C++

Overview of C++ - Types and Declarations - Arrays, Pointers, Structures, References and Functions - Function Overloading - Name spaces - Source Files and Programs.

ABSTRACT DATA TYPE IN C++

Class - Class members and Access control - Constructors- Static members - Default copy constructor - Const member functions - this pointer - Structs - Inline function definition - Concrete classes - Destructors - new and delete - Member objects. **(11)**

OPERATOR OVERLOADING

Operator functions - Binary and unary operators - Member and non member operators - Friend functions - Large objects - Function call -Increment and Decrement - A string class - Dereferencing **(8)**

INHERITANCE

Derived Classes - Class Hierarchies - A virtual functions - Abstract classes. Templates: Function templates - Derivation and Templates. **(10)**

EXCEPTION HANDLING AND LIBRARY CLASSES

Grouping of exceptions - Catching exceptions - Exceptions that are not errors - Uncaught Exceptions - Standard exceptions - The standard library - I/O streams - File streams. **(10)**

TOTAL : 45

TEXT BOOK

1. *Bjarne Stroustrup, "The C++ Programming Language", 3rd edition, Pearson Education, 2000.*

RFERENCE BOOKS

1. *Ira Pohl, "Object Oriented Programming Using C++", 2nd Edition, Pearson Education, 2006.*
2. *Herbert Schildt, "The Complete Reference C++", 4th edition, Tata McGraw Hill, 2003.*
3. *Stanley B Lippman, Jove Lajoie, and Barbara Moo "C++ Primer", 5th Edition, Addison Wesley, 2012.*

15MSS25 - DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS13

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Choose the appropriate data structure for a specified application*
- *Demonstrate the abstract properties of various data structures such as stacks, queues, lists and trees in real world application*
- *Trace and code recursive methods and compare with iterative methods.*
- *Implement and compare the complexities of various sorting algorithms including bubble sort, heap sort and quick sort*
- *Demonstrate understanding of linear and binary search algorithms*

CONCEPTS TO BE COVERED

1. Applications of 2D, 3D arrays.
2. Evaluation of expression using stack.
3. Recursion - Towers of Hanoi, Ackermann's function, Fibonacci series.
4. Implementation of basic queue operations, priority queue, circular queue.
5. Implementation of self referential structures (FIFO, LIFO).
6. Applications of circular linked list.
7. Applications of doubly linked list.
8. Traversals of binary tree.
9. Implementation of sorting and searching techniques.

15MSS26 - OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Determine the visibility requirements for data members and member functions and communication requirements among objects while constructing classes for a given scenario.*
- *Demonstrate static binding using function overloading and operator overloading for manipulating real-life objects*
- *Design object oriented system for realizing reusability and run time polymorphism.*
- *Create persistent objects using iostream class hierarchy.*
- *Incorporate exceptional handling mechanism appropriately while building an object oriented systems.*

CONCEPTS TO BE COVERED

1. Identification, construction and destruction of objects
2. Overloading
3. Friend functions
4. Inheritance
5. Polymorphism
6. Exception handling
7. Using I/O Streams
8. File Operations
9. Generic Programming

15MSS27 - SCRIPTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop static and dynamic web pages and enhance the pages using CSS properties*
- *Convert the existing web sites with better and generic style properties for the entire website*
- *Employ dynamic XML for client side data storage, construct processing codes for client and server side*
- *Design and add functionalities to web pages on client and server side with cookies, regular expressions, database connectivity and ActiveX controls*
- *Construct new web designs with emerging internet technologies*

CONCEPTS TO BE COVERED

1. Simple HTML programs with formatting tags, tables, images, lists and frames
2. Interactive pages using anchors, image maps and forms
3. XHTML representation of web pages.
4. Cascading Style Sheets - Dynamic properties for individual, group and random elements
5. JScript programs for simple arithmetic, string processing, arrays, built in and user defined functions, client side validations
6. XML - Database, DTD, XSD, XSL representation
7. PHP / Apache Tomcat- simple programs for embedding html and php, arrays, string processing
8. Server side validations, cookies, database connectivity.

15MSS31 - DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	2	0	4

PRE-REQUISITES

15MSS12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Discover in the construction and understanding of mathematical proofs.*
- *Employ common mathematical arguments and proof strategies in function and relations.*
- *Define a sense of familiarity and ease in working with mathematical notation and common concepts in discrete mathematics.*
- *Express the basic results in groups, monoids and lattices.*

COMBINATORIAL MATHEMATICS

Basic counting principles, Permutations and combinatorics, Inclusion and Exclusion Principles, Pigeon Hole Principle, Recurrence relations, Application. **(7)**

SETS, RELATIONS AND FUNCTIONS

Set Theory - Basic concepts of set theory, Operations on sets, the power set, Relation - Basics of relations, Types, Representation of relations, Equivalence relation , Partial ordering relations. Functions - Introduction to functions, Types, Sequences, Indexed classification of sets, Recursively defined functions, Cardinality. **(10)**

ALGEBRIC SYSTEMS

Groups, Semigroups and monoids Cyclic semigraphs and submonoids, Subgroups and Cosets. Congruence relations on semigroups. Morphisms. Normal subgroups. Structure of Cyclic groups permutation groups, dihedral groups. Elementary applications in coding theory. Rings-Subrings -morphism of rings ideals and quotient rings. Euclidean domains, Integral domains and fields. **(10)**

MATHEMATICAL LOGIC AND SET THEORY

Propositions and Logical Operations, Quantifiers, Conditional Statements and tautologies, Methods of Proof , Principles of Mathematical Induction. **(8)**

LATTICES AND BOOLEAN ALGEBRA

Definition, Types of lattices, Hasse diagram, Partially ordered sets. Boolean Algebra - Basic definition, duality , Basic theorem ,Boolean algebra as Lattices, Representation, Theorem, Sum - of - products form for Boolean Algebra, Minimal Boolean Expression, Prime implicants, Logic gates and circuits. **(10)**

TOTAL : 45+30=75

TEXT BOOKS

1. *Lipschutz , "Discrete Mathematics -Schaum series", Mc Graw Hill Publication.*
2. *Alan Doerr and Kenneth Levarseur, "Applied Discrete Structures for Computer Science", free open book.*

REFERENCE BOOKS

1. *Tremblay & Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata Mc Graw - Hill.*
2. *S. Arumugam, "Linear Algebra"*

15MSS32 - COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS15

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a computer organization, Demonstrate how the various computer system components work and justify why they perform so*
- *Given the instruction set of a processor, develop assembly language programs that meets the given requirements.*
- *Given a CPU organization, design a memory module for a given specification*
- *Given a CPU organization, design an I/O module for a device by choosing appropriate mode of transfer and justify choice.*
- *Given the instruction set, format of the instructions, and cycles needed for execution, can evaluate the execution time of a program*

BASIC COMPUTER ORGANIZATION

Stored program organization - registers - instructions - Timing and control - Instruction cycle - Memory reference instructions - input/output and interrupt - Design of Basic computer - design of accumulator logic - Programming the basic computer. **(9)**

MICROPROGRAMMED CONTROL

Control memory - Address sequencing - Microprogram example- Design of control unit. CENTRAL PROCESSING UNIT: General register organization - stack organization - Instruction formats - Addressing modes - Data transfer and manipulation - Program control- Reduced Instruction Set computer. **(9)**

COMPUTER ARITHMETIC

Addition - subtraction - multiplication and division algorithms - Floating point Arithmetic operations - Decimal arithmetic unit and operations. **(9)**

I/O ORGANIZATION

Peripheral devices - Input/output interface - Asynchronous Data Transfer - Modes of Transfer- Priority interrupt - Direct Memory Access - Input-output processor - Serial communication. **(9)**

MEMORY ORGANIZATION

Memory Hierarchy - Auxiliary memory -Associative memory - Cache memory - Virtual Memory - Memory management hardware. **(9)**

TOTAL : 45

TEXT BOOK

1. *M Morris Mano, "Computer system Architecture", Pearson Education, 2007.*

REFERENCE BOOKS

1. *John L Hennessy and David A Patterson, "Computer Architecture - A Quantitative Approach", V Edition, Morgan Kaufmann, 2007.*
2. *Carl Hamacher, Zuonko Uranesic & Safwat Zoky, "Computer Organization", 5th edition, McGraw Hill, 2002*

15MSS33 - OPERATING SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13, 15MSS14, 15MSS23

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the batch programming, system calls and virtual machines*
- *Demonstration of Kernel Management for Inter Process Communication systems*
- *Estimation of system performance through scheduling algorithms - FIFO, round robin, priority, shortest job first*
- *To gain the knowledge to handle the memory allocation and deallocation for both static and dynamic storage*
- *Design and Develop a new simple File System using Disk and File System Management*

INTRODUCTION

System Software - Macro Processor - Loader - Linker - Operating systems -objectives and functions. Evolution of Operating system - serial processing, simple batch systems, multi- programmed batch system, time sharing systems.

Process Description And Control

Process status, Process description, Process control - Processes and threads. **(10)**

CONCURRENCY

Principles of concurrency, mutual exclusion - software support, Dekker's Algorithm - mutual exclusion - hardware support, mutual exclusion - Operating System support - Semaphore - Monitors - Implementation - Message Passing. Deadlock - deadlock prevention, deadlock detection, deadlock avoidance. An integrated deadlock strategy. **(8)**

MEMORY MANAGEMENT

Memory management requirements. Fixed partitioning, placement algorithm. Dynamic partitioning placement algorithm. Replacement algorithm. Relocation. Simple paging - Simple segmentation.

VIRTUAL MEMORY

Paging - address translation in a paging system. Segmentation - organization. Address translation in a segmentation system. Combined paging and segmentation. Virtual memory - Operating System software - fetch policy, placement policy and replacement policy. Page buffering. Resident set management.**(12)**

SCHEDULING

Types of scheduling, scheduling algorithms, scheduling criteria, FIFO, Round Robin, Shortest process next, Shortest remaining time, Highest response ratio and Feedback scheduling. Performance comparison. Fair - share scheduling. **(6)**

I/O MANAGEMENT AND DISK SCHEDULING

Organization of the I/O function - evaluation of the I/O function. Logical structure of the I/O function, I/O buffering. Disk I/O - Disk scheduling algorithms. Disk cache.

File Management

Files, File management systems, File system architecture, Functions of File management - File directories - File sharing - secondary storage management. File allocation. **(9)**

TOTAL : 45

TEXT BOOKS

1. *William Stallings, "Operating systems Internals and Design Principles", 4th edition, PHI, 2001.*

REFERENCE BOOKS

1. *Silberschatz A., Peterson J.L and Galvin P., "Operating System Concepts", John Wiley Publishing Company, 2002.*
2. *H.M.Deital, " An introduction to Operating System", Pearson Education, 2001*
3. *Charles Crowley, "Operating System a Design Oriented Approach", Tata McGraw Hill, 2000.*
4. *Milankovic M, "Operating System Concepts & Design", McGraw Hill,1999.*
5. *Armass Danesl, "Mastering Linux", Premium Edition, BPB Publications, 1999*
6. *Robert Cowart, Boyd waters "Windows NT 4 ", BPB Publications, 1997.*

15MSS34 - ADVANCED DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS23

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design, implement, test and debug programs using a variety of data structures including binary and general tree structures, search trees, B-trees, Tries, graph , heaps,hash tables and buffer pools.*
- *Describe and implement a variety of advanced data structures (AVL Tree, Multiway Tree, B+Tree, Red Black Tree).*
- *For a given data structure, a student will be able to classify best, average, worst and amortized scenario with respect to a problem.*
- *Identify the problem given and design the algorithm using various algorithm design techniques like Divide and Conquer, Greedy method, Dynamic Programming, Backtracking and Branch and Bound Technique*
- *Recognize and apply design techniques and make judgements about which particular design technique will improve performance of a problem*

TREES

Binary search tree: Definition, operations - AVL Tree: Balancing trees, node operations. **(6)**

MULTIWAY TREES

Definition - m-way search trees - B-trees - Red Black tree - operations - Trie Structures - B+ trees. **(11)**

GRAPHS

Representation - Breadth first search - Depth first search - Topological Sort **(5)**

HEAP

Definition - heap data structures - heap algorithms - applications.

HASHING

Basic concepts - hashing methods - hashing algorithms - collision resolution methods. **(10)**

ALGORITHM DESIGN TECHNIQUES

DIVIDE & CONQUER

General method - Merge sort.

GREEDY METHOD

General method - Knapsack problem -Prim's & Kruskal's algorithm.

DYNAMIC PROGRAMMING

General method - Multistage graph- Travelling Salesperson Problem.

BACK TRACKING

General method - Eight queen's problem. **(13)**

TOTAL : 45

TEXT BOOKS

1. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudocode Approach with C", 2002, Thomson Asia Pvt Ltd. (Trees, Multiway trees, Heap, Hashing)*
2. *Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamental of Computer Algorithms", Galgotia Publications, 1998. (Algorithm Design Techniques)*
3. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein "Introduction to Algorithms", Second Edition, Prentice Hall of India, Publications, New Delhi, 2007. (Graphs, Red Black Trees).*

REFERENCE BOOKS

1. *Anany Levitin, "Introduction : The Design & Analysis of Algorithm", 2003 Edition, Pearson Education Inc.*
2. *S.K.Basu, "Design Method & Analysis of Algorithm", PHI, 2005.*

15MSS35 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS14

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose applicable software life-cycle model to develop software for given customer need and justify choice with reference to complexity, cost and time.*
- *Analyze software requirements based on customer need and develop industry standard Software Requirement Specification (SRS) document*
- *Construct models using functional and object oriented design principles and concepts based on SRS document.*
- *Prepare suitable structural and behavioural analysis models based on SRS document.*
- *Design and develop test cases for given software requirement.*

SOFTWARE ENGINEERING OVERVIEW

Introduction - Socio-technical Systems - Software Process - Project Management. **(8)**

REQUIREMENTS

Software Requirements - Requirements Engineering Process - System Models. **(10)**

SOFTWARE DESIGN

Architectural Design - Application Architectures - User Interface Design. **(12)**

DEVELOPMENT AND TESTING

Rapid Software Development -Verification and Validation- Software Testing. **(8)**

EVOLUTION AND CONFIGURATION

Software Maintenance - Configuration Management. **(7)**

TOTAL : 45

TEXT BOOK

1. *Ian Somerville, "Software Engineering" , 8th edition, Pearson, 2011.*

REFERENCE BOOKS

1. *Roger S.Pressman "Software Engineering -A Practitioner's approach", 7th edition, McGraw Hill International edition 2010.*
2. *Pankaj Jalote, "An integrated approach to software Engineering", 3rd edition Narosa publishing house, reprint 2013.*

15MSS36 - ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS23

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Ability to apply suitable data structure for the given real world problem*
- *Understand the importance of abstract data type, and their basic usability in different applications through different programming languages.*
- *Use various algorithmic design techniques including divide-and-conquer, greedy, dynamic and back tracking for efficient algorithm design*
- *Design and analyze the algorithm to identify time and space complexity of the data structure*
- *Able to implement various kinds of searching and sorting techniques.*

CONCEPTS TO BE COVERED

1. Operations on binary search tree.
2. Operations on AVL tree
3. Hash Table implementation
4. Construction of heap & its operation
5. Implementation of Divide & Conquer Method
6. Implementation of Greedy Method
7. Implementation of Dynamic Method
8. Implementation of Back tracking Method.

15MSS37 - VISUAL PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design a windows software solution by identifying attributes and behaviour and grouping them into user interfaces using appropriate controls and UI components, for a given set of user requirements*
- *Design and develop interactive applications using standard tool box, advanced controls like progressbar, menubar, etc, event handling and ADO for a given user specification*
- *Design a web software solution by identifying attributes and behaviour and grouping them into user interfaces using appropriate controls and UI components using ASP.NET, for a given set of user requirements*
- *Design and develop interactive web applications using ASP.NET and ADO.NET*
- *Organize the written set of application programs into packages and deploy using appropriate tools*

CONCEPTS TO BE COVERED IN LAB

1. Simple Windows applications using standard tool box controls (Button, Label, Text, Drop Down List, etc) with event handling
2. Windows application using advanced controls (FileDialog, ProgressBar, etc)
3. Design and develop database applications using ADO.NET library (MSAcess/MySql)
4. Use of stored procedures in database applications
5. Design simple web applications using ASP.NET Server controls
6. Web applications with database

CONCEPTS TO BE COVERED IN TUTORIALS

1. Introduction to VS.NET IDE and framework components
2. Exercise in basic C# /VB.Net language primitives

a. Basic data types, arrays, control structures, Loops, functions

3. Exercise in basic ASP.Net language primitives
4. Exercise on database connectivity code using ADO.NET

15MSS38 - OPERATING SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16, 15MSS25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Ability to handle the shell commands, functionaly and scripts.*
- *To Create batch programming, system calls and virtual machines*
- *To develop Kernel Management programs for Inter Process Communication systems*
- *To evaluate system performance through scheduling algorithms - FIFO, round robin, shortest job first*
- *Ability to handle effectively memory allocation and deallocation for both static and dynamic storage*

CONCEPTS TO BE COVERED

1. Shell Basics
    a. Types of shells
    b. Shell functionality
    c. Environment
2. Writing first script
    a. Writing script and executing basic script
    b. Debugging script
    c. Making interactive scripts
    d. Variables(default variables)
    e. Mathematical expressions
3. Conditional Statements
    a. if -else-elif
    b. test command
    c. Logical operators - and, or, not
    d. case - esac

4. Loops
    a. while
    b. for
    c. until
    d. break and continue
5. Command Line arguments
    a. Positional parameters
    b. set and shift
    c. IFS
6. Functions and file manipulations
    a. Processing file line by line
    b. Functions
7. Regular Expression & Filters
    a. grep, cut, sort
    b. grep patterns
8. SED & AWK
9. Processes
    a. Concept of process in Unix
    b. Background processes
    c. Scheduling processes - At, batch & cron
10. Misc
    a. Trapping signals
    b. String substitutions / manipulations
11. Advanced Scripting Techniques
    a. Providing command line options to scripts
    b. Shell and Sub shells
    c. Exporting variables
    d. Arrays
12. Implement CPU Scheduling Algorithms : FIFO, SJF, Round Robin
13. Implement Bankers Algorithm to avoid deadlock
14. Implement the Producer - Consumer problem using semaphores
15. Implement Page Replacement algorithms

15MSS41- RESOURCE MANAGEMENT TECHNIQUES

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To solve the Linear programming Problem, Transportation and Assignment problem.*
- *To discuss the elementary Inventory models, Price break models and Safety stock problems.*
- *To categorize the Queuing models and also simulate the problems using Monte - Carlo Technique.*
- *To analyze the network models using CPM and PERT and to discuss the replacement problems.*

LINEAR PROGRAMMING

Linear programming problem - canonical and standard forms- formulation - graphical solution - simplex method. **(9)**

DUALITY

Definition of duality - primal - dual relationships - assignment model - Hungarian Technique-transportation model - Vogels approximation method - degeneracy - unbalanced problems. **(9)**

SEQUENCING AND REPLACEMENT

Sequencing - Basic assumptions - sequencing n jobs on 2 machines (Johnson's procedure)

Replacement - need for replacement of equipments - failure mechanism of items - Replacement policy - Replacement of items that deteriorates gradually - Replacement of items that fail suddenly. **(9)**

INVENTORY

Need for the inventory - Costs involved in inventory - Concepts of average inventory, economic order quantity - Deterministic model: Fixed ordering quantity models - EOQ model with uniform demand, finite / infinite replacement with / without shortages -EOQ with one price break. Inventory control - Buffer stock - Determination of optimum buffer stock - EOQ system of ordering - Multi item order model - ABC analysis. **(9)**

QUEUING THEORY AND SIMULATION

Characteristics of queuing systems, steady state M/M/1 model.

Simulation-Monte Carlo method-applications to queuing and inventory problems

PERT & CPM NETWORKS

Critical path method- network - calculations - floats - critical path(cost analysis-crashing-Least cost schedule algorithm).

PERT- Network - critical path. Probability of meeting a scheduled date of completion of the project. **(9)**

TOTAL : 45+30=75

TEXT BOOK

1. *Hamdy, A Taha, "Operations Research - An introduction", Pearson Education India ,2004.*

REFERENCE BOOKS

1. *S. D. Sharma "Operations Research ", Kedar Nath ram Nath & co publishers, 10th edition, 1995.*
2. *Kanti Swarup, P.K. Gupta, Mani Mohan, "Operations Research", Sultan Chand & Sons, 2001.*
3. *Hillier & Lieberman, "Operations Research - An Introduction", Tata McGrawHill, 2004*

15MSS42 - THEORY OF COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS31

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the role of different types of compution models*
- *Construct regular expressions and finite state mechine for a given set of languages.*
- *Contruct pushdown automata and context free grammars for a given set of languages.*
- *Design Turing machine for a given language.*
- *Describe Fundamental principles underlying various programming languages features.*

MACHINES

Basic machine - FSM - Deterministic & Non deterministic finite Automata Equivalence of DFA & NFA - Applications of finite automata - finite automata with €- transitions. **(8)**

REGULAR EXPRESSIONS AND GRAMMARS

Definition - Equivalence of regular expression and finite automata-Applications of regular expressions. Grammars: Definition - Types - Leftmost , Rightmost Derivations - Syntax trees - Ambiguity. **(10)**

PUSH DOWN AUTOMATA

Deterministic & Non deterministic - Acceptance by empty stack and final state. one stack and two stack. **(8)**

THEORY OF COMPUTATION

Turing machine - Types - Universal TM- Halting problem - Recursive and recursively enumerable languages- Rice theorem - Linear bounded TM **(9)**

LANGUAGE DESIGN

Evolution of programming languages - criteria for language design - defining syntax : character set, BNF - variable , expressions and statements - types - abstract data type -inheritance - polymorphism - procedures. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Hopcroft J.E., Motwani R. and Ullman J.D, " Introduction to Automata Theory, Languages and Computations" , Second Edition , Pearson Education , 2008(Para 1 to Para 4)*
2. *Ellis Horowitz, "Fundamentals of programming language" Galgotia publications , 2nd edition 1997. (Para 5)*

REFERENCE BOOKS

1. *John C Martin, "Introduction to Languages and the Theory of Computation" , Third Edition , TataMcGraw Hill Publishing Company, New Delhi, 2007.*
2. *Kamala Krithivasan and Rama . R. "Introduction to formal languages, Automata theory and Computation", Pearson Education 2009.*

15MSS43 - MICROPROCESSORS AND ASSEMBLY LANGUAGE PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS15, 15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a program segment, demonstrate how the various units of 8086 interact in executing it.*
- *Given a set of requirements, develop assembly language program using 8086 instruction set.*
- *Design memory modules for a 8086 based system for a given specification.*
- *Illustrate how a simple sensor / actuator can be interfaced to 8086 based system.*
- *Differentiate a given processor architecture with 8086 in terms of operating modes, support for multitasking operating system and exception handling.*

INTRODUCTION

Computer architecture and advances - classes of computers - 8086/8088 Microprocessor: Internal architecture - addressing modes - assembler directives - instruction format- instruction set and assembly language programming. **(9)**

MEMORY INTERFACING

Types of Memories - ROM and static RAM Interfacing Techniques - Dynamic Memories - DRAM Interfacing - Error detecting and correcting in DRAM arrays. **(9)**

PERIPHERAL DEVICES AND THEIR INTERFACING

Data transfer schemes - Input and Output modes - 8086 interrupts and interrupt responses - 8259 programmable interrupt controller - 8254 programmable counter/interval timer - Direct Memory Access mode I/O - 8237 programmable DMA controller. **(9)**

DIGITAL AND ANALOG INTERFACING

DIGITAL : Programmable Parallel ports (8255) - interfacing simple devices. ANALOG : Sensors and Transducers - Case Study: A microcomputer based scale. **(9)**

HIGH END PROCESSORS

Issues in building a multitasking operating system - Architecture of 80386 processor - Operating modes - 80386 segment privilege levels protection - interrupt and exception handling - Task switching - Architecture of Pentium processor - operating modes. **(9)**

TOTAL : 45

TEXT BOOK

1. *Douglas V Hall, SSSP Rao, "Microprocessors and its Interfacing", 3rd Edition, TMH, 2012.*

REFERENCE BOOKS

1. *Yn-cheng Liu,Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", second edition, Prentice Hall of India, 2006.*
2. *Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processor Architecture, Programming, and Interfacing", Seventh Edition, 2006, Prentice Hall.*

15MSS44 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS13, 15MSS23, 15MSS33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the purpose and architecture of database systems from the perspective of persistent storage of real world data.*
- *Analyse the problem statement, construct the Entity Relationship model and map it into relational model by applying normalization.*
- *Generate Relational Algebra, Relational Calculus and SQL statements to perform queries of real world applications*
- *Evaluate the indexing techniques and choose the suitable technique by analyzing the given application*
- *Determine the concurrency control and recovery mechanisms based on the criticality of the transaction*

INTRODUCTION

Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Architecture, Database Users and Administrators.

Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations. **(4+6)**

DATABASE DESIGN

Database Design and the E-R Model, Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Extended E-R Features.

Relational Database Design: Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory. **(6+5)**

INTRODUCTION TO SQL

Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database.

Intermediate SQL : Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization

ADVANCED SQL

Accessing SQL from a Programming Language, Functions and Procedures, Triggers

Formal Relational Query Languages : The Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus. **(10)**

DATA STORAGE AND INDEXING

File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer. Indexing and Hashing: Basic Concepts, Ordered Indices, Overview of B+-Tree Index Files and Hashing Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL. **(7)**

TRANSACTION, CONCURRENCY CONTROL AND RECOVERY

Concept, Simple Transaction Model, Atomicity and Durability, Isolation, Serializability, Isolation and Atomicity, Isolation Levels. Lock-based Concurrency Control, Time Stamp based Concurrency Control, Failure Classification, Recovery and Atomicity. **(7)**

TOTAL : 45

TEXT BOOK

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.*

REFERENCE BOOKS

1. *Ramez Elmasri, Shamkant B. Navathe Durvasula, V.L.N. Somayajulu, Shyam K. Gupta, " Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.*
2. *Christopher Allen, Simon Chatwin, Catherine A. Creary, "Introduction to Relational Databases and SQL Programming", Tata McGraw-Hill,2003.*

15MSS45 - JAVA PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS24

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a software requirement, design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes.*
- *Write java programs by employing the object oriented constructs of inheritance and polymorphism for a given software requirement*
- *For a given software solution, organize the application programs into packages and prepare a deployable application*
- *Generate robust java applications for a given user requirement by employing applicable object oriented concepts and handling all possible exceptions*
- *Design and develop interactive two tier or three tier web applications using Swings, Applets and JDBC for a given user specification*

INTRODUCTION

The Object Model - The Evolution of the Object Model - Elements of the Object Model - Applying the Object Model

An Introduction to Java - The Programming Environment - Fundamental Programming Structures in Java - Static fields and methods - Method Parameters - Object Construction - Packages - The Class Path. **(7)**

BASICS

INHERITANCE :

Classes, Super Class and Subclass Objects - The Cosmic superclass - Generic Array Lists - Object Wrappers and AutoBoxing - Methods with a variable number of parameters - Enumeration Classes.

INTERFACES AND INNER CLASSES

Interfaces - Object Cloning - Interfaces and callbacks - InnerClasses. DEPLOYING APPLICATION : JAR Files - EXCEPTIONS - Dealing with Errors - Catching Exceptions. **(10)**

USER INTERFACE COMPONENTS WITH SWING

Swing - Introduction to Layout Management - Text Input - Text Fields - Labels and Labelling Components - Password fields - Text areas - Scroll Panes. Choice Components - check boxes, Radio Buttons and combo boxes. Dialog Boxes - Option Dialogs and Creating Dialogs. **(6)**

APPLETS

Types of Applets- Applet Basics - The applet Class - Applet Architecture - An applet Skeleton- Applet Initialization and Termination - Display Methods- Requesting Repainting - Using the Status Window - Passing parameters - Applet Context and Show document **(5)**

COLLECTIONS

Collection Interface - Concrete collections - The Collections Framework - Legacy Collections - The Hashtable Class **(9)**

MULTITHREADING - Threads - Interrupting Threads - Thread states.

Database Connectivity : JDBC **(8)**

TOTAL : 45

TEXT BOOKS

1. *Grady Booch "Object - Oriented Analysis and Design with Applications" , Second Edition, Pearson Education, 2004*
2. *Gary Cornell and Cay S.Horstmann, "Core Java Volume1", Eighth Edition, Pearson Education 2013*
3. *Y.Daniel Liang "JAVA PROGRAMMING", 7th Edition, Pearson Education 2009.*

REFERENCE BOOKS

1. *Herbert Shiltz, "Java: The Complete Reference", Seventh Edition, Tata McGraw Hill, 2007.*
2. *Schaum's OuTlines " Programming With Java", Second Edition, Tata McGrawHill, 2004*

15MSS46 - MICROPROCESSORS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use DOS and BIOS interrup handlers to develop assembly language programs.*
- *Develop assembly language programs exploiting the instruction set of 8086 to meet the given requirements.*
- *Use assembler directives and macros to develop assembly language programs.*
- *To handle software interrupts, Develop interrupt service routines for X86 based system.*
- *Design and develop terminate and stay Resident programs for X86 systems.*

STUDENTS MUST BE TRAINED FOR

1. Using DOS and BIOS interrupts
2. Using Assembler Directives
3. Writing programs exploiting all instructions of 80X86
4. Writing macros
5. Writing interrupt service routines
6. Writing FAR and NEAR procedures
7. Writing Terminate and Stay Resident programs

15MSS47 - DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design the conceptual data model as Entity Relationship diagram and create the database using DDL statements for a given application*
- *Formulate simple DML SQL queries to retrieve the required data for real world applications*
- *Generate DML queries with Subqueries, Joins, Group By, Order By and Aggregate functions to filter and aggregate the data of the real world applications*
- *Construct reusable PL/SQL blocks with Functions, Procedures, Packages, Triggers, Exception Handling, and Cursors as required by OLTP applications*
- *Develop a database project by constructing the ER model, creating Tables and generating SQL and PL/SQL blocks using RDBMS platform*

CONCEPTS TO BE COVERED

1. Designing a database for an application and representing it through ER diagram
2. Creating and managing tables
3. Basic SQL SELECT statements
4. Restricting and sorting data
5. Single row functions
6. Displaying data from multiple tables
7. Aggregating data using Group function - Group By
8. Subqueries
9. Views, Sequence, Index, Synonym
10. SET operators, Date and Time functions
11. PL / SQL Programs
12. Exception Handling, Cursors, Functions, Procedures, Package, Triggers

15MSS48 - JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes, for a given set of user requirements*
- *Write java programs by identifying the appropriate data structures and employing the object oriented constructs of inheritance, abstract class, interfaces and run-time and compile-time polymorphism, where applicable, for a given software requirement*
- *Generate robust multithreaded java applications that can handle all possible exceptions for given set of user requirements*
- *Organize the written set of application programs into packages and prepare a deployable jar using appropriate jdk tools*
- *Design and develop interactive applications using Swings, Applets, event handling and JDBC for a given user specification*

CONCEPTS TO BE COVERED

1. Creating Classes and Objects
2. Inheritance
3. Polymorphism
4. Runtime Polymorphism using Abstract Class and Interface
5. Packages
6. Exceptions
7. Multithreading
8. Collections
9. Swings and Applets
10. Event Handling
11. JDBC

CASE STUDY ON

1. Linear Programming using Simplex Method
2. Sequence Problem using Johnson's Procedure
3. Cost Analysis using Least cost Schedule Algorithm
4. Inventory Problem using Monte Carlo Method

15MSS49 - COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

Communication Skills - 50 marks

Personality Development - 50 marks

COURSE OUTCOME

- *Conceive appropriate verbal responses from the learners to a given social situation, using the guidelines to effective speaking skills and body language.*
- *Generate trouble shooting solutions to develop team building and interpersonal skills with case studies that focus on body language and empathy.*
- *Develop appropriate responses for business phone calls and formulate effective resolutions to professional conflicts that arise out of cross cultural communication gaps in a given managerial context.*
- *Compose appropriate written responses to professional problems faced by a team at the workplace arising out of ineffective communication skills.*
- *Ascertain the various concepts of Self like the Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self with respect to the Western(Occidental) and Eastern(Oriental) theories of the Self and Personality Development.*
- *Outline the significant effects of Self Confidence to build team confidence, given the foundation principles of Self Motivation and Confidence.*
- *Assess the various personalities and attitudes and choose the best attitude for making bold decisions in personal and professional contexts.*
- *Project the appropriate grooming and the right etiquette in the corporate context to excel in professional life.*

INTRODUCTION

Introduction - Code and Content - Stimulus and Response: Source - The Encoding Process - The Channel - The Decoding Process - The Receiver - Speaking Skills - Effective Speaking Guidelines - Communicating Soft Skills: A Self-assessment - ClosingTips **(6)**

SOFT SKILLS

Introduction to Soft Skills - Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills: Time Management - Attitude - Responsibility - Ethics, Integrity, Values and Trust - Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed reading - Leadership - Body Language

TELEPHONING SKILLS & NEGOTATIONS

Preparing to make a telephone call - Receiving calls - Taking and leaving messages - Asking for and giving repetition - The secretarial barrier - Cross-cultural communication on the telephone - Setting up appointments - Changing arrangements - Ending a call - Cross-cultural communication on the telephone - Problem-solving on the telephone - Complaints - Negotiations: Types of negotiation - Preparation for a negotiation - Making an opening statement - Bargaining and making concessions - Accepting and confirming - Summarizing and looking ahead - Types of negotiator - Dealing with conflict - Rejecting - Ending the negotiation **(10)**

WRITING SKILLS TO CREATE AN IMPRESSION

Introduction- Fifteen Principle to Increase Clarity in Communication - Edit-Edit-Edit: The Reader's Perspective - Clarity of Thought - Clarity of Text. **(7)**

PERSONALITY DEVELOPMENT

One's Personality Sends Out a Signal That Others Read - Same Person: Consciously Different Personalities can be Powerful - There isn't One Right Personality; It Differs by Role - Learning about Personality Development from the Three Cases - Personality Analysis - Freudian Analysis of Personality Development - Swami Vivekananda's Concept of Personality - Development: Physical Self - Energy Self - Intellectual Self - Mental Self - Blissful Self - Personality Begets. **(9)**

LEADERSHIP QUALITIES & INTERPERSONAL SKILLS

Resolving Conflict - A Smiling Face - Appreciative Attitude - Assertive Nature - Communication Skills - Listening Skills - Developing Empathy - The Personality Attribute of Taking Bold Decisions - Personality Types and Leadership Qualities - Mapping the Different Personality Types - Personality Tests: Example of a Personality Test: Jung Typology Test - Personality Assessment **(9)**

ETIQUETTE

Social Etiquette - Corporate Etiquette - Personal Grooming - Using minimal Body Language - Leadership and Entrepreneurship : Corporate Training - Professionalism - Self awareness - Creativity skills - Cognitive Development - Assertiveness - Positive Thinking and Attitude. **(10)**

TOTAL : 60

REFERENCE BOOKS

1. *Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.*
2. *Krishna Mohan, Meera Banerji. "Developing Communication Skills" Mac Million Publishers, 2012.*
3. *Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

15MSS51 - COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To solve a given application, can apply Evolutionary programming techniques.*
- *To solve a given application, can apply swarm intelligence techniques.*
- *Develop and implement a basic trainable neural network for a computing application*
- *Develop and implement a basic fuzzy logic system for a typical computing application*
- *Analyze a given problem, and identify and define the computing requirements appropriate to its solution.*

INTRODUCTION

Introduction to Artificial Intelligence - Intelligent agents - Introduction to Computational Intelligence - Computational Intelligence Paradigms **(9)**

ARTIFICIAL NEURAL NEWORKS

Artificial Neuron - Supervised Learning Neural Networks - Unsupervised Learning Neural Networks - Radial Basis Function Networks - Reinforcement Learning **(9)**

EVOLUTIONARY COMPUTATION

Introduction - Genetic Algorithms - Genetic programming - Evolutionary Programming **(9)**

COMPUTATIONAL SWARM INTELLIGENCE

Basic Particle swarm optimization - Social Network Structure - Basic variations - Basic PSO parameters - Single solution Particle optimization - Applications **(9)**

ARTIFICIAL IMMUNE SYSTEM and FUZZY SYSTEMS

AIS: Natural Immune system - Artificial immune models. Fuzzy Systems: Fuzzy sets - Fuzzy logic reasoning - Fuzzy controllers - Fuzzy Sets **(9)**

TOTAL : 45

TEXT BOOKS

1. *Andries P. Engelbrecht, Computational intelligence: an introduction, edition 2, John Wiley and Sons, 2007. (para 2, para 3, para 4 and para 5)*

2. *Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern Approach", Pearson Education, 3rd Edition, 2010.(para 1)*

REFERENCE BOOKS

1. *Eberhart, E. and Y. Shi., Computational Intelligence:Concepts and Implementations, Morgan Kaufmann, San Diego, 2007*
2. *Konar, A., Computational intelligence : Principles, Techniques, and Applications , Springer, Berlin, Germany, 2005.*

15MSS52 - OBJECT ORIENTED SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS24, 15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the role of unified process in object oriented software development*
- *Draw the usecase model by identifying the actors and usecases from the given requirements.*
- *Analyze the given requirements and generate the analysis class and interaction models from usecase model*
- *Generate the structural, behavioral and deployment design models using design patterns for object oriented systems*
- *Evaluate the correctness of the developed system by testing the system at various levels*

THE UNIFIED PROCESS

Use-Case Driven, Architecture-Centric, Iterative and Incremental - Phases of Unified Process - Modeling with UML **(7)**

REQUIREMENTS ELICITATION

Introduction - Overview - Concepts - Activities. **(6)**

ANALYSIS

Introduction - Overview - Concepts - Activities. **(8)**

SYSTEM DESIGN

Decomposing the System - Addressing Design Goals **(8)**

OBJECT DESIGN

Reusing Pattern Solutions - Specifying Interfaces - Mapping Models to Code **(12)**

TESTING

Introduction - Overview - Concepts - Activities. **(4)**

TOTAL : 45

TEXT BOOKS

1. *Bernd Bruegge& Allen H. Dutoit, "Object-Oriented Software Engineering Using UML, Patterns, and Java", Prentice Hall, Third Edition, 2010*

2. *Ivar Jacobson, Grady Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, Sixth Impression, 2011.*

REFERENCE BOOK

1. *Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, Eighth Printing, 2001.*

15MSS53 - COMPUTER NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *For a given inter-network specification, choose appropriate inter-networking devices.*
- *For given requirements, can develop simple network applications using Socket API*
- *For a given inter-network, find the best route to a destination by applying the various routing protocols*
- *For a given network application, can identify the protocols involved at the various layers and demonstrate the role of the protocols*

BASICS

Building a Network: Applications - Requirements - Network architecture - Implementing Network Software - Performance. Connecting to a network: Perspectives on Connecting - Framing - Error Detection - Reliable Transmission - Ethernet and Multiple Access Networks **(10)**

INTERNETWORKING

Switching and Bridging - Basic Internetworking - Routing - Implementation - IPv6 **(10)**

END -TO - END PROTOCOLS

Simple demultiplexer - Reliable Byte Stream - Remote Procedure call - Transport for Real-Time Applications **(9)**

CONGESTION CONTROL AND RESOURCE ALLOCATION

Issues in Resource allocation - Queuing Disciplines - congestion control - Congestion Avoidance - Quality of Service **(8)**

APPLICATIONS

Traditional Applications - Web services - Multimedia applications - Infrastructure services. **(8)**

TOTAL : 45

TEXT BOOK

1. *Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann, 5th Edition, 2012.*

REFERENCE BOOKS

1. *Larry L Peterson, Bruce S Davis, Computer Networks, 5th Edition, Elsevier, 2012.*
2. *Andrew S. Tanenbaum, David J Wetherall, Computer Networks, 5th Edition, Pearson Education, 2010.*
3. *Behrouz Forouzan, "Introduction to Data communication and networking", Tata McGraw Hill 1998.*
4. *William Stallings, "Data communication", Pearson Education Asia 2004.*

15MSS54 - OBJECT ORIENTED SOFTWARE DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Construct Use Case model, which includes Actors(primary and secondary), Usecases (Precondition, Post Condition, Successful and Alternative Scenario)to describe the requirements of a given problem using Requisite Pro*
- *Generate Software Requirements Specification Document to specify the system requirements using Requisite Pro*
- *Design the Analysis Class model that consists of classes/objects and their basic attributes, methods and relationships among them by realizing the usecases using Rational Rose.*
- *Design the Structural model as Class Diagrams with refined attributes, methods and relationships of analysis classes/objects to describe the structure of the software system*
- *Design the Behavioral model as Interaction Diagrams with set of objects and the message communications among them to describe the processes of the given system*
- *Evaluate the software system design models(structural and behavioral) by implementing and executing in Java platform*

LABORATORY PROBLEMS TO COVER THE FOLLOWING :

1. Determining the scope of the problem.
2. Requirement Analysis and generating usecase model *
    a. Identifying actors
    b. Identifying usecases
    c. Writing usecase description (detailed usecase)
3. Analysis class/object identification and generating analysis model **
    a. using noun phrase analysis
    b. use case realization(using sequence or collaboration diagram for usecases)
    c. Finding attributes
    d. Performing classification(generalization/specialization)
    e. Relating classes/objects (links, association)

4. Design class model creation **
    a. Finding methods
    b. Refining attributes and associations
    c. Generating behavioral model **
5. Writing JAVA code to implement the above model.

* Using Rational Requisite Pro

** Using Rational Rose

15MSS55 - NETWORK PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop and implement TCP based distributed applications using Socket API for a given set of requirements*
- *Develop and implement UDP based distributed applications using Socket API for a given set of requirements*
- *Develop network debug tools such as ping, trace-route etc using SOCK_PACKET and SOCK_RAW options*
- *Demonstrate the functioning of the various network protocols using ns2 simulation tool.*
- *Develop new simple protocols for given requirements and demonstrate its working using ns2*

THE STUDENTS MUST BE TRAINED TO DEVELOP

1. TCP and UDP applications by exploiting Socket API - concurrent and iterative
2. Applications making use of the various socket options
3. Debugging and maintenance tools with the help of RAW sockets and SOCK_PACKET
4. Programs using SIGALRM, SO_RCVTTIMEO, non-blocking sockets
5. I/O multiplexing
6. Simple scenarios using NS-2 and study the operation of various Internet work protocols

15MSS61 - SOFTWARE ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35, 15MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the need for creating the decomposition, process and allocation architectural views of the software systems*
- *Choose the patterns for designing the architecture of the software system based on the type of the system*
- *Design the architecture of the system using attribute driven technique.*
- *Evaluate the correctness of the software system architecture using ATAM method*
- *Specify the architecture of the system using z-notation*

INTRODUCTION TO SOFTWARE ARCHITECTURE

Software Architecture Definition and Needs - Architectural Patterns - Reference Models - Reference Architecture - Architectural Structures and Views **(8)**

ARCHITECTURAL PATTERNS

From Mud to Structure: Layers, Pipes and Filters and Object-Oriented- Database Systems: Blackboard- Distributed Systems: Broker - Interactive Systems: Model View Controller and Presentation Abstraction Control - Adaptive Systems: Microkernel and Reflection- Case Studies: Key Word in Context and Instrumentation Software. **(12)**

THE ARCHITECTURAL BUSINESS CYCLE

Creating an Architecture-Understanding Quality Attributes - Achieving Qualities - Designing the Architecture **(10)**

ARCHITECTURE DOCUMENTATION AND EVALUATION

Documenting Architectures - Analyzing Architectures: ATAM - Software Product Lines - Case Study in Product Line Development. **(8)**

FORMAL SPECIFICATION

The Value of Architectural Formalism - Introduction to z-notation - Formalizing the Architecture of a Specific System - Formalizing the Architectural Style. **(7)**

TOTAL : 45 + 15 = 60

TEXT BOOKS

1. *Frank Buschmann, RegineMeunier, Hans Rohnex, Peter Sommerland and Michael Stal, "Pattern - Oriented Software Architecture - A Systems of Patterns Volume - I", (Reprint 2010) (Para - II)*
2. *Mary Shaw and David Garlan, "Software Architecture - Perspectives on an Emerging Discipline", PHI,1996 (Para V)*
3. *Len Bass, Paul Clements and Rick Kazman, "Software Architecture in Practice", 2nd Edition, Pearson Education, First Indian Reprint, 2003. (Para I, III & IV)*

15MSS62 - MOBILE COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the basic problems, limitations, and strengths of various wireless technologies*
- *Differentiate the roles of the protocols at various layers of WLAN protocol stack from that of wired LAN stack*
- *Illustrate the roles of the protocols and architectural components employed in cellular networks.*
- *Justify the need to modify the existing Internet and Transport layer protocols to support mobility*
- *Identify the challenges in developing mobile application for a given set of requirements*

INTRODUCTION

Vision of Next generation Mobile computing - Challenges.

Layer 1 and 2

Wireless Communication : Frequency Spectrum - Signal propagation - Modulation - Multiplexing - Spread Spectrum

Medium Access Control: Motivation for a specialized MAC - Accessing the medium: SDMA - FDMA - TDMA- CDMA **(9)**

WIRELESS TECHNOLOGIES

GSM : Services - architecture - radio interface - Protocols - Localization - Handover - Security - Data Services - 3G Cellular System: UMTS **(9)**

WIRELESS LAN TECHNOLOGIES

Infrastructure and ad-hoc networks - IEEE 802.11: Architecture - Physical Layer - MAC layer - MAC Management - Newer developments- Security in wireless LAN.

Bluetooth : Architecture - Protocols - Security. **(9)**

HIGHER LAYERS

Mobile Network Layer : Mobile IP - Dynamic host configuration Protocol - Mobile ad-hoc networks - ad-hoc network security.

Mobile Transport Layer : Traditional TCP -Classical TCP Improvements to support mobility- TCP over 2.5G/3G wireless Networks **(9)**

MOBILE APPLICATION DEVELOPMENT

Mobile hardware - Software Platforms - Comparison of software platforms - mobile development supporting tools

Mobile Application Challenges: Location Aware mobile computing - Mobile Messaging **(9)**

TOTAL : 45

TEXT BOOKS

1. *Jochen Schiller, "Mobile Communications", Addison-Wesley, 2004.*
2. *Pei Zheng and Lionel Ni, "Smart Phone and Next Generation Mobile Computing", Elsevier Inc, 2006. (para 5).*

REFERENCE BOOKS

1. *Asoke K Talukder and Roopa R Yavagal, "Mobile computing: technology, applications, and service creation", Tata McGraw Hill, 2005.*
2. *Raj Kamal, Mobile Computing, Oxford university press, 2nd edition, 2012.*

15MSS63 - SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze different approaches to test software, and select applicable techniques for different situations and projects.*
- *Design test plans, create test procedures and define criteria for adequacy.*
- *Apply black box and white box testing techniques at various testing levels for given requirements.*
- *Examine standards, models and techniques aimed at achieving quality in different software development environments.*
- *Prepare a software quality plan for a software project considering process evaluation models including issues related to change management, configuration management, validation and verification and measurement.*

INTRODUCTION

The Role of Process in Software Quality - Testing as a Process - Overview of the Testing Maturity Model (TMM)-Basic definitions-Software Testing Principles-Origin of Defects-Defect Classes, the Defect Repository ad Test Design - Defect examples: the coin problem. **(8)**

TESTING STRATEGIES

Test case design strategies-Black Box Approach-Random Testing - Equivalence Class Partitioning-Boundary Value Analysis-Cause and Effect Graphing-State Transition Testing - Error Guessing - White Box Approach-Test Adequacy Criteria-Coverage and Control Flow Graphs-Covering Code Logic-Data Flow and White Box Test Design-Loop Testing-Mutation Testing. **(10)**

LEVELS OF TESTING

Unit Test: Functions, Procedures, Classes and Methods as Units-Unit Test Planning - Designing the Unit Tests - The Class as a Testable Unit - The Test Harness - Integration Test: Goal - Integration Strategies for Procedures and Functions - Integration Strategies for Classes - Designing Integration Test. **(10)**

SYSTEM TEST AND TESTING ARTIFACTS

System Test- The Different Types-Regression Testing -Alpha, Beta and Acceptance Tests-Test Planning - Test Plan Components-Test Plan Attachments- Reporting Test Results **(9)**

SOFTWARE QUALITY

Defining Quality-Importance of Quality- Quality Assurance at each Phase of SDLC-Managing Software Quality in an Organization-Quality Management System-Product Quality and Process Quality **(8)**

TOTAL : 45

TEXT BOOKS

1. *Ilene Burnstein, "Practical Software Testing", Springer International Edition, First Indian reprint, 2004. (para 1, para 2, para 3 and para 4)*
2. *Nina S Godbole "Software quality Assurance, Principles and Practice", Narosa Publishing House,2004 (para 5)*

REFERENCE BOOKS

1. *C.Jorgensen,"Software Testing-A Craftman'sApproach",CRC press,1995.*
2. *Boris Beizer,VanNostrandReinhold."Software Testing Techniques", 2ndEdition, 1990.*
3. *GlenfordJ.Myers,"The Art of Software Testing", Wiley, 3rd edition, 2011.*

15MSS64 - MOBILE APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS22

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use the concept and functionalities of scripting language.*
- *Apply mobile application models/architectures and patterns to the development of a mobile application*
- *Design and develop sophisticated mobile user Interfaces for the Android platform.*
- *Develop mobile applications for the Android operating system that use basic and advanced mobile features*
- *Demonstrate the application to handheld devices.*

Students must be trained for

HTML5

Creation of fully functional HTML5 app

Android

Building a basic UI-driven App

Using PhoneGap to package HTML5 apps into native apps

Creating Android services

Applications carrying out data management with SQLite3

Basic Networking using WebKit

Image manipulation

Proximity and Location services (Android NFC, Bluetooth, Google Maps)

15MSS65 - SOFTWARE TESTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS35

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyze given requirements, identify suitable testing techniques and develop test cases and test data for testing.*
- *Given requirements and executable code, write test cases in JUnit, execute test cases and interpret results.*
- *Given a business need, use Rational Suite to develop requirements, UML design and develop test related artifacts applicable across the SDLC.*
- *Design and develop test cases using Selenium for web based testing.*

INTRODUCTION AND PROJECT DEFINITION

Introduction of tools used in the lab-Discussion on various projects and learn to write problem definition.

SOFTWARE REQUIREMENT SPECIFICATION

Learn how to write requirements and specifications-Gain exposure to requirements management using Requisite pro.

RATIONAL SUITE

Benefits of using Rational suite-Rational Administrator-Rational Test Manager-Rational Clear Quest-Rational Pure Coverage-Rational Purify-Rational Requisite pro-Rational Robot.

WIN RUNNER

Identifying GUI objects-Spying on GUI Objects-choosing GUI Map mode-The GUI Map File per Test Mode-The Global GUI Map File Mode-Creating Data Driven Test-Creating Batch Test-Running the test-Analyzing test results-Recording the test-Synchronizing the test-Running the synchronized test .

Open source testing software to be used.

Tools : J Unit, Selenium

15MSS81 - SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate working knowledge to define scope of project , project objective, estimation of project's size, cost and effort for the successful completion of given software project*
- *Develop project planning activities using Critical path method or Goldratt's critical chain method that accurately forecast project cost, required resources and timeline.*
- *Calculate effort and cost required to complete the given project by choosing from effort estimation technique, function point analysis, wide band Delphi, COCOMO, and effort estimation techniques iterations model based planning , and Cost estimation technique cost factor analysis, activity based cost estimation, cost estimation for iterations based planning.*
- *Given a project examine the categories of risk associated for the project , perform risk analysis and enumerate its related risk management. Examine associated configuration management.*
- *Classify different types of Project monitoring and project control techniques*

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Project initiation management: Define project scope, define project objective, Estimate initial project size, estimate effort and cost, estimate project schedule, create initial project plan, project initiation in iterative model. **(9)**

SOFTWARE PROJECT EFFORT AND COST ESTIMATION

Effort estimation techniques - function point analysis, wide band Delphi, COCOMO, effort estimation for iterations model based planning - Cost estimation: cost factor analysis, activity based cost estimation, cost estimation for iterations based planning, schedule estimation. **(9)**

RISK MANAGEMENT

Causes of risk, risk categories, risk analysis, artifacts of project risk management. Configuration Management : configuration management techniques , artifacts of configuration management **(9)**

PROJECT PLANNING

Project planning fundamentals, project planning techniques - critical path method, Goldratt's critical chain method, planning at project management office **(9)**

PROJECT MONITORING AND CONTROL

Project monitoring, project control techniques, project monitoring and control artifacts, project monitoring and control in iterative model. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Ashfaque Ahmed, "Software Project Management: A process Driven Approach ",CRC Press, 2011. (para 1, para 2 and para 3)*
2. *Andrew Stellman and Jennifer Greene, "Applied Software Project Management", OReilly Media Inc., Indian Reprint, Sep 2010. (para 4, para 5)*

REFERENCE BOOK

1. *"Introduction to Information System Project management", David L. Olson, Mc Graw Hill 2nd, 2003.*

15MSS82 - INTERNET OF THINGS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53, 15MSS62

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the challenges for smart object*
- *Given an application, assess the different IoT technologies that suits the application*
- *Demonstrate knowledge of MAC and routing protocols developed for Low Power and Lossy networks.*
- *Design simple IoT systems comprising sensors, edge devices, wireless network connections and data analytics capabilities.*
- *Demonstrate knowledge of main architectures and paradigms for the Internet of Things*

INTRODUCTION

Smart Objects - Challenges for Smart Objects - IP for Smart Objects: motivation and main challenges - Security for Smart objects - Web services for Smart Objects - Connectivity models for Smart Object Networks - Introduction to the Internet of Things: application scenarios, current solutions. **(9)**

SMART OBJECTS AND LLNS

Hardware and Software - Energy Management - Communication for Smart Objects: IEEE 802.15.4: main features, topologies, addressing and MAC frame format - Low Power and Lossy Networks (LLN): Introduction to 6LoWPAN - 6LoWPAN architecture: simple, extended and ad-hoc networks - 6LoWPAN adaptation layer -Issues in determining IPv6 links in LLNs - IPv6 addressing in 6LoWPAN- 6LoWPAN forwarding: route-over and mesh under approaches - Neighbour Discovery optimizations and extensions to the ND protocol for 6LoWPAN networks. **(11)**

ROUTING IN LOW POWER AND LOSSY NETWORKS

Mesh-under and route-over solutions - Routing Requirements - Routing metrics - The IPv6 Routing Protocol for LLNs (RPL)- Protocol operation - use of destination oriented directed acyclic graphs - DODAG formation - RPL Messages **(9)**

CoAP

Interaction model - Messages and Request/Response Model - Resource observing - Service discovery - Resource discovery - CORE Link Format **(9)**

APPLICATIONS

Smart Cities and Urban automation - Home Automation - Building Automation - Structural Health Monitoring **(7)**

TOTAL : 45

TEXT BOOK

1. *J.-P. Vasseur, A. Dunkels, "Interconnecting Smart Objects with IP: The Next Internet", Morgan Kaufmann, 2010.*

REFERENCE BOOKS

1. *Z. Shelby, C, "Bormann. 6LoWPAN: The Wireless Embedded Internet", Wiley, 2009*
2. *Z. Sahelby, K. Hartke, K. Hartke, "The Constrained Application Protocol (CoAP)", RFC 7252, 2014.*

15MSS83 - INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *For a given requirement, choose the required sensor and calibrate.*
- *Devise interface circuit for connecting a chosen sensor to Galileo board.*
- *Develop software for Galileo board to interact with the sensor to meet the requirements*
- *Develop software to interact (send/receive data) with Web/Application server located in the Internet*
- *Use data analytics tool to analyze the data collected and present the report to the end user.*

THE STUDENTS MUST BE TRAINED FOR

1. Deploying CoAP servers on motes
2. Developing applications using Galileo board, exploiting all features of the board.

15MSS91 - INFORMATION SECURITY

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS33, 15MSS44, 15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Illustrate the principles of information security and employ them to secure the information.*
- *Identify and prioritize assets and threats to secure the assets in the event of attacks.*
- *Practice professional, and ethical attitude and aware of legal issues in the context of information security.*
- *Choose suitable risk management strategies for the organization's information security requirements.*
- *Discuss policies, standards, models and technologies for the given scenario related to information security.*

INTRODUCTION

Security : Goal, Vulnerabilities, threats, attacks, and controls, Methods of Defense; Cryptography: Terminology and Background, Substitution Ciphers, Transpositions, DES, AES Encryption Algorithms **(7)**

NUMBER THEORY

Number Theory - Modular Arithmetic, Euler's Theorem, Euclid's Algorithm, Prime test, Chinese Remainder Theorem, Discrete Logarithm, Public Key Encryption - RSA Algorithm, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Authentication Code, Secure Hash Algorithm, Digital Signature Algorithm. **(9)**

PROGRAM SECURITY AND TRUSTED OPERATING SYSTEMS DESIGN

Program Security : Secure Programs, Non-malicious Program Errors, Viruses and Other Malicious Code, Controls against Program Threats

Designing Trusted Operating Systems : Trusted System, Security Policies, Models of Security, Trusted Operating System Design **(7)**

DATABASE AND DATA MINING SECURITY

Security Requirements, Reliability and Integrity, Sensitive data, Inference, Multilevel Databases -Security Issues, Data Mining - Privacy and Sensitivity, Data Correctness and Integrity, Availability **(7)**

SECURITY IN NETWORKS

Threats in networks, Network Security Controls : Encryption: Virtual Private Networks- PKI-SSH -

SSL - IPSec, Content Integrity, Access Controls, Wireless Security, Honeypots, Traffic Flow Security, Firewalls - Intrusion Detection Systems - Secure e-mail. **(8)**

ADMINISTRATION, LEGAL AND ETHICAL ISSUES

Security Planning : Contents of a Security Plan, Risk Analysis

Legal and Ethical Issues : Protecting Programs and Data, Information and the Law, Computer Crime, Case Studies of Ethics **(7)**

TOTAL : 45

TEXT BOOKS

1. *Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007. (para 3, para 4, para 5 and para 6)*
2. *William Stallings, "Cryptography and Network Security: Principles and Practices", Fifth Edition, Prentice Hall, 2010.(para1 and para2)*

REFERENCE BOOKS

1. *Michael Whitman, Herbert J. Mattord, "Management of Information Security", Third Edition, Course Technology, 2010.*
2. *Matt Bishop, "Introduction to Computer Security", Addison-Wesley, 2004.*
3. *William Stallings, Network Security Essentials, Applications and Standards, 3rd Edition, Pearson Education, 2007.*

15MSS92 - PROFESSIONAL ETHICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a problem scenario, analyse the situation and suggest solutions based on human values like honesty, courage, empathy, character and morality*
- *When presented with a moral dilemma, critically analyse and present solutions using theories of moral autonomy and theories of right action.*
- *Examine a given scenario in the professional life of an Engineer and present a critical note on possible behaviours using professional codes of conduct of Engineers*
- *Engage in informed critical reflection on the nature of professionalism and ethical challenges inherent in professionalism in matters relating to collegiality, loyalty, occupational crime, confidentiality and conflicts of interest*
- *When presented with case on moral issues relating to weapons development or such matters of conflicting interest, critical evaluation of the case using the various professional codes of conduct and present ethical solutions*

HUMAN VALUES

Morals, Values and Ethics - Integrity - Work Ethic - Honesty - Courage -Empathy - Self-Confidence - Character **(8)**

ENGINEERING ETHICS

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and Controversy - Models of Professional Roles - Theories about Right Action - Self-interest - Customs and Religion - uses of ethical theories. Valuing Time - Co-operation - Commitment **(10)**

ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study **(8)**

SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational Crime - Professional Rights - Employee Rights - IPR - Discrimination **(10)**

GLOBAL ISSUES

Multinational corporations - Environmental Ethics - Computer Ethics - Weapons Development - Engineers as Managers-Consulting Engineers-engineers as expert witnesses and advisors -moral leadership - sample code of conduct. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996. (para 2,3,4,5)*
2. *M. Govindarajan, S. Natarajan, V. S. Senthilkumar, "Professional Ethics and Human Values", Prentice Hall, 2013. (para 1)*

REFERENCE BOOKS

1. *Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.*
2. *Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004*
3. *Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases", Wadsworth Thompson Learning, United States, 2000*
4. *John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.*

15MSS93 - INFORMATION SECURITY LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Determine the security threats, attacks and controls on information resources*
- *Construct symmetric and asymmetric algorithms to preserve confidentiality, integrity and authenticity of information*
- *Demonstrate network security tools including Packet capturing, Port scanning, Firewall, Intrusion detection, Mac Spoofing and full disk encryption*
- *Implement Steganography under various media including text, images and audio*
- *Devise own defensive measures for securing information resources for different enterprises including Government, Industry, Academia and Society*

LIST OF PROGRAMS

1. Implementing Substitution cipher
2. Implementing Transposition cipher
3. Implementing DES, BLOWFISH, AES algorithms
4. Implementing RSA, DIFFIE-HELLMAN key exchange algorithm, ECC algorithm
5. Implementing MAC, SHA, MD5 algorithms
6. Learning to install and work with Packet capturing tool Wireshark
7. Learning to install and work with Port scanning tool Nmap
8. Learning to install and work with Packet filtering firewall Retina
9. Learning to install and work with Intrusion Detection tool Snort
10. Learning to install and work with MAC Spoofing tool Smac
11. Learning to install and work with Disk encryption software TrueCrypt / VeraCrypt
12. Mini project on - Steganography, Visual Cryptography

15MSSE01 - SOFTWARE USER INTERFACE DESIGN

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Devise the design procedure for both heterogeneous and homogeneous user populations*
- *Choose UI frameworks for both object and task based interfaces as a User- Centred design*
- *Compose models for any scenarios and be able to design from prototypes.*
- *Identify the issues surrounding user-centered design of software applications.*
- *Pronounce themselves as an experienced interface designer.*

Good Interface design - The Gap - Bridge the gap - Bridging user needs to Object Oriented GUI prototype - Introduction - Pervasive Techniques (PANDA) - explicit steps - Mapping task flows to task objects - steps-Mapping task objects to GUI Objects. **(10)**

Gap - Representations in User Centered Design - links among representation - Psychology of the designer - Decision making - Heuristics and Meta heuristics - UI Design. Models and transformations - the essential and user model - the user interface design **(9)**

Light Weight Techniques - design context - Representing top-level concerns, work as objectives - problems and Interruptions - Scenarios - Need for dialogue model. Interaction design - Bridging the gap - Design Context - Bubbling technique **(8)**

Surviving the dangers of UI design - delta method - TSS 2000 case study - Before crossing the gap - Conceptual design - User interface design - after the bridge. Redesign of complex legacy systems - characteristics of projects - Planning the construction of bridge - Laying the foundation - Building - Documenting. **(10)**

Bridge Gap in software development process - the problem - the gap - systematic creativity - interview, using the systematic creativity - bridge the gap - directions. New generation products - examples - exploratory design stage - refinement and analysis stage - design stage - documenting and iterative process. **(8)**

TOTAL : 45

TEXT BOOK

1. *Larry E. Wood, "User Interface Design - Bridging the Gap from User Requirements to Design", CRC Press, First Edition, 1997.*

REFERENCE BOOKS

1. *Allen Cooper, Robert Reimann, "The Essentials of Interaction Design", Willey, Fifth Edition, 2007.*
2. *Jenifer Tidwell, "Designing Interfaces", Second Edition, O'Reilly Media, 2011.*
3. *Steven Hoober, Eric Berkman "Designing Mobile Interfaces" O'Reilly Media, First Edition, 2011.*

15MSSE02 - SOFTWARE LANGUAGE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS23, 15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Conceive the syntax and semantics of control structures and data abstractions for programming languages.*
- *Conceive the features such as un-typed and simply-typed in functional and imperative languages.*
- *Describe the features of Lambda Calculus including type systems.*

Notions of syntax and semantics of programming languages, introduction to operational/natural semantics of functional and imperative languages **(9)**

Data abstractions and control constructs; block-structure and scope, principles of abstraction, qualification and correspondence **(9)**

Parameter passing mechanisms; runtime structure and operating environment; practical and implementation issues in run-time systems and environment **(9)**

Abstracts machines; features of functional and imperative languages; the untyped and simply-typed **(9)**

Lambda calculus, type systems for programming languages including simple types and polymorphism; objects, classes and inheritance in object-oriented languages **(9)**

TOTAL : 45

TEXT BOOK

1. *Michael Scott, Morgan Kaufmann, "Programming Language Pragmatics", 2000*

REFERENCE BOOKS

1. *Friedman, Wand and Haynes, "Essentials of Programming Languages", Prentice-Hall International, 1998*
2. *Tennant, "Principles of Programming Languages", Prentice-Hall International, 1981*

15MSSE03 - ENTERPRISE APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS22, 15MSS45

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the role of Component Technologies in developing reusable and easy accessible enterprise application*
- *Develop the client applications (browser / Java client) using J2EE platform by analyzing the requirements of the given system*
- *Design and Develop the web tier components of an enterprise application using Servlet*
- *Construct the application components includes Process and Data components using Enterprise Java Bean Technologies*
- *Integrate the client, web and application components using web 2.0 to generate rich internet applications*

USING J2EE PLATFORM

INTRODUCTION

Challenges of Enterprise Application Development - The Platform for Enterprise Solutions - Enterprise Application Scenario - J2EE platform Technologies: Component Technologies, Platform Roles, Platform Services, Service Technologies, Communication Technologies - Java Database Connectivity Framework- Java Naming and Directory Interface. **(9)**

THE CLIENT TIER AND THE WEB TIER

Client Considerations - Design Issues and Guidelines for Browser Clients - Design Issues and Guidelines for Java Clients.

Web Tier Technologies - Web Tier Application Structure - Web Tier Application Framework Design - Programming Servlets **(10)**

THE ENTERPRISE JAVA BEAN TIER

Business Logic and Business Objects - Enterprise Beans as J2EE Business Objects - Remote and Local Client Views - Entity Beans - Session Beans - Message Driven Beans - Design Guidelines - Portability Guidelines - Programming Enterprise Java Beans. **(10)**

INTEGRATING WITH THE ENTERPRISE INFORMATION SYSTEM TIER

Integration Scenarios - J2EE Integration Technologies - Application Integration Design Approaches - Developing an Integration Layer- Packaging and Deployment: Roles and Tasks - Packaging J2EE Application - Deployment Description - Deployment Tools **(6)**

USING WEB 2.0, USER GENERATED CONTENTS AND RICH INTERNET APPLICATIONS

Introduction to Web 2.0: Web 2.0 Definition - Web 2.0 Versions and Generations - Characteristics and Memes of Web 2.0.

Wikis - Blogs - Communities - Collaborations and Collaborative Technologies.

Practices, Technologies and Frameworks - Content Aggregation, Syndication and Federations using RSS and Atom - Web 2.0 Architecture Case Studies. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Sing.I, Stearns. B, Johnsons. M and The Enterprise Team, "Designing Enterprise Applications with the J2EE Platform", Addison Wesley, Boston, 2002. (Para I, II, III, IV)*
2. *Stephen Asbury and Scott R.Weiner, "Developing Java Enterprise Applications", Wiley Publications, Second Edition, Reprint, 2008. (Para II, III)*
3. *Krishna Sankar and Susan A Bouchard, "Enterprise Web 2.0 Fundamentals", Cisco Press, First Edition, 2009. (Para V)*

15MSSE04 - DATA CENTRIC COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSPE18, 15MSSE19

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe large scale distributed systems used for storing and processing massive data and using large-scale computing systems to solve data-intensive real-world problems in scientific and engineering disciplines*
- *Explain the architecture and properties of the computer systems needed to store, search and index massive data*
- *Demostrate the computational models such as MapReduce and High Performance techniques for processing large data sets*
- *Design efficient algorithms for processing massive data in a distributed computing setting and implement analytics on massive data using computational engines*
- *Design the models for load balancing, scheduling and resource allocation computational tasks on large computing clusters*
- *Evaluate the requirements of adequate security in Data-Intensive Computing and protecting the data*

DATA-INTENSIVE COMPUTING - INTRODUCTION

A Challenge for the 21st century - Characterizing Data-Intensive Applications - Anatomy of Data-Intensive Computing Applications **(8)**

DATA-INTENSIVE COMPUTING ARCHITECTURE

Hardware Architectures - Data Management Architecture - Overview of Cloud Computing - Large-scale Data Management Techniques in Cloud Computing Platform - Data-Intensive applications with MapReduce, High Performance Network Architecture for Data-Intensive Computing. **(9)**

DATA-INTENSIVE SOFTWARE SYSTEMS

Architecting Data-Intensive Computing software systems - ECL/HPCC: A unified approach to Big Data - Scalable Storage for Data-Intensive Computing **(9)**

TECHNOLOGIES AND TECHNIQUES

Load Balancing Techniques for Data-Intensive Computing - Parallel Processing, Multiprocessors and Virtualization in Data-Intensive Computing **(9)**

SECURITY IN DATA-INTENSIVE COMPUTING

Security in Data-Intensive Computing systems - Data Security and Privacy in Data-Intensive Computing clusters - Information Security in large scale distributed systems - Privacy and Security requirements of Data-Intensive Computing Clouds **(10)**

TOTAL : 45

TEXT BOOKS

1. *Ian Gorton, Deborah K. Gracio, "Data-Intensive Computing - Architectures, Algorithms and Applications", Cambridge University Press, 2013. (para 1 and para 2)*
2. *BorhoFurht, Armando Escalante, "Handbook of Data-Intensive Computing", Springer.(para 3, para 4 and para 5)*

REFERENCE BOOK

1. *Frederic Magoules, Jie Pan, FeiTeng, "Cloud Computing - Data-Intensive Computing and Scheduling", CRC Press, Taylor & Francis Group .*

15MSSE05 - AGILE PROCESS MODELS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35, 15MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Ascertain the need of software development methodologies with agility and self adaptability features for developing the software to meet the user needs.*
- *Compare the practices followed in different agile methodologies and choose the suitable methodology for a given project*
- *Synthesize the various agile methodology practices to produce a methodology for a project*
- *Develop the system by employing test first programming concept using Junit framework.*
- *Develop a simple application using Scrum or XP methodology*

INTRODUCTION TO AGILE DEVELOPMENT

Agile and Self Adapting : The Cooperative Game Principle - Agile Overview-Evolution of Agile Methodologies-Agile outside Software Development **(9)**

AGILE SOFTWARE DEVELOPMENT ECOSYSTEMS (ASDE)

The Scrum Process - Scrum's Contributions - Dynamic Systems Development Method (DSDM) Principles - The DSDM Process - DSDM's Contributions-Crystal Methodology Design Principles - The Crystal Framework - Crystal Method - Crystal's Contributions. **(9)**

The Feature Driven Development(FDD) Process Model - Beyond the FDD process Description - Conceptual Similarities and Differences - FDD's Contributions - Extreme Programming(XP) Basics - XP values and Principles - XP's Contributions - Adaptive Software Development Life Cycle - Leadership-Collaboration Management -ASD's Contributions. **(9)**

DEVELOPING AN ASDE

Articulating Ecosystem - Designing Agile Methodology - The Agile Metamorphosis **(8)**

J UNIT FRAMEWORK

Automatic Tests - Goal -Fixtures-Testing Exceptions - Junit's Implementation - Junit API - Test First Programming - Stub - Other Uses for Tests - Extending Junit - Junit and Ant - Running Junit Standalone - Junit and IDEs. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison-Wesley, Second Edition, 2007. (Para I)*
2. *Jim Highsmith, "Agile Software Development Ecosystems", Addison Wesley, 2002. (Para II, III, IV)*
3. *Kent Beck, "Junit Pocket Guide", O'Reilly Media, First Edition, 2004. (Para V)*

REFERENCE BOOK

1. *Craig Larman, "Agile & Iterative Development - A Manager's Guide", Pearson Education, 2004.*

15MSSE06 - SOFTWARE REQUIREMENTS ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate how prototypes may be used in the RE process.*
- *Analyze of user and system requirements.*
- *Examine how software requirements may be organized in a requirements document.*
- *Describe and develop the activities in the requirements engineering process.*

INTRODUCTION

Importance of Requirements Engineering, Misconceptions, Industrial Challenges, Key Success Factors, Definition, Relationship to Business Processes Characteristics, Requirements and Project Failure, Quality and Metrics. **Requirements Engineering Artifact Modeling:** Re Taxonomy, Artifact Model, Templates, Artifact Model Tailoring, System Life Cycle Process. **Elicting Requirements:** Issues and Problems, Methods, Customer-Specific Business Rules, Managing Customer Relationship, Managing and Planning Elicitation, Cost Estimation, Customer Relationship, Elicitation for Incremental Product Development. **(10)**

REQUIREMENTS MODELING

MDRE, Advantages, Prerequisites, Processes, Elicitation and Analysis Model Heuristics, Determining Model Completeness, Analysis to Design, Model Conversion Heuristics, Design Model Structure, Tooling **(9)**

QUALITY ATTRIBUTE REQUIREMENTS

Integrated Model, Requirements, Selecting Stakeholders, Methods, Testing ASRs, Case Study **(8)**

RE FOR PLATFORMS AND REQUIREMENTS MANAGEMENT

Challenges, Practices, Experiences. **Requirements Management:** Change Management, Routine Activities, Traceability, Measurements and Metrics, Scalability, Requirements Management Process, Measuring Savings, Organizational Issues. **(9)**

REQUIREMENT DRIVEN SYSTEM TESTING AND REQUIREMENTS EVOLUTION

Inputs, Model Based Testing, Testing Performance and Scalability, Requirements, Best Practices

Requirements Evolution Techniques: Prototyping, Practices and Experience. Distributed RE Hazard Analysis and Threat Modeling. **(9)**

TOTAL : 45

TEXT BOOK

1. *Brian Berenbach, Daniel J. Paulish, Juergen Kazmeier, Arnold Rudorfer, "Software and Systems Requirements Engineering in Practice", Tata McGraw Hill Edition, 2009.*

15MSSE07 - SOFTWARE RELIABILITY

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS63

ASSESSMENT : THEORY

COURSE OUTCOME

- *Define the basic concept of software reliability and software reliability model*
- *Describe fault detection and correction approaches*
- *Apply Software Reliability Growth Models in Software Development.*
- *Analyze the design principles for achieving higher reliable software system.*
- *Design the scientific concepts of Software and Hardware Reliability.*

INTRODUCTION

Need and Concepts of Software Reliability, Failure and Faults - Prevention, Removal, Tolerance, Forecast, Dependability Concept- Failure Behaviour, Characteristics, Maintenance Policy, Reliability and Availability Modeling, Reliability Evaluation. **(9)**

SOFTWARE RELIABILITY MODELS

Historical Perspective and Implementation, classification, limitations and issues, Exponential Failure Models - Jelinski moranda model, Poisson, Musa, Exponential models, Weibull Model, Musa(okumoto Model, Bayseian Model - Littlewood verral Model, Phase Based Model **(9)**

PREDICTION ANALYSIS

Model Disagreement and Inaccuracy - Short & Long Term Prediction, Model Accuracy, Analyzing Predictive Accuracy - Outcomes, PLR, U & Y Plot, Errors and Inaccuracy, Recalibration - Detecting Bias, Techniques, Power of Recalibration, Limitations in Present Techniques, Improvements. **(9)**

THE OPERATIONAL PROFILE

Concepts and Development Procedures - Customer Type, User Type, System Mode, Functional and Operational Profile, Test Selection ,Selecting Operations, Regression Test, Special Issues - Indirect Input Variables, Updating, Distributed system, CASE STUDY (Application of DEFINITY & FASTAR, Power Quality Resource System) **(9)**

TESTING FOR RELIABILITY MEASUREMENT

Software Testing - Types, White and Black Box, Operational Profiles - Difficulties, Estimating Reliability, Time/Structure based software reliability - Assumptions, Testing methods, Limits, Starvation, Coverage, Filtering, Microscopic Model of Software Risk. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Patric D. T.O connor, "Practical Reliability Engineering", 4th Edition, John Wesley & sons, 2003.*
2. *John D. Musa, "Software Reliability Engineering", Tata McGraw Hill, 1999.*
3. *Michael Lyu, "Handbook of Software Reliability Engineering", IEEE Computer Society Press, 1996.*

15MSSE08 - OPEN SOURCE SOFTWARE DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the advantage of using open source software in application development*
- *Choose appropriate open source software during different stages of software development life cycle*
- *Modify the existing open source software and customize according to different user requirement.*
- *Assess the viability of using licensed versus open source software in developing solution to real time problems in various domains*
- *Justify the need to have open source community through active participation in open source code development.*

INTRODUCTION

Software source code definition- Open source definition- Examples of open source software products. History of open source software: The Berkeley software distribution-tex-the free software foundation-Linux-Apache-Mozilla-Advocacy groups-FSF and OSI-Project coordinators and hosts-OSS companies. **(9)**

OPEN SOURCE SOFTWARE PROCESS

Framework for analyzing open source software: zachman's framework for IS architecture CATNOE and soft systems method- Deriving an analytical framework for OSS. Qualification to define a software system as open source: defining open source software-categorizing open source software-Specific characteristics of open source software. Transformation: OSS developing process-Taboos and harms in OSS development-OSS development life cycle **(9)**

OSS STAKEHOLDERS AND ENVIRONMENT

Stakeholders : OSS stake holders-OSS developers communities-OSS user communities-OSS commercial organizations-OSS non-commercial organizations. Open source development environment. **(9)**

WORLD VIEW

A framework for classifying OSS motivations-Technological micro level motivations-technological macrolevel motivations-economic macro level motivations-social political micro level motivations **(9)**

OPEN SOURCE LICENSING

Contract and copyright law-Basic principles of copyright law-Contracts and copyright-open source software licensing-Issues with copy rights and patents-Examples: The Apache license V1.1 and V2.0, the academic free license and the Mozilla public license 1.1.Non open source license: Classic proprietary license-Sun community source license-Microsoft shared source Initiative. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Joseph Feller and Brain Filzgerald, "Understanding open source software development", Pearson education limited (Addison Wesley) 1st Edition, 2000. (Para I to IV).*
2. *Andrew M ST Laurent, "Understanding open source and free software licensing", O'Reilly media inc, 1st Edition,2004. (Para V).*

REFERENCE BOOKS

1. *Lawrence E.Rosen, "Open source Licensing: Software Freedom and Intellectual Property, Law", Prentice Hall, 2005.*
2. *Van Lindberg, "Intellectual Property and Open Source: A Practical Guide to Protecting Code, 2008.*

15MSSE09 - GRAPHICS AND MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Recognize the need for graphical systems*
- *Deduce the primitive graphical operations*
- *Differentiate the various Multimedia file formats*
- *Develop graphical applications with animations*
- *Assess on the latest graphical issues*

INTRODUCTION

Graphics hardware - raster and random scan - display devices - input devices -hard copy devices. Implementation algorithms for graphic primitives - line, poly line, circle, ellipse, curves - attributes - fill Styles **(8)**

TRANSFORMATIONS AND VIEWING

Two dimensional geometric transformations - translation - scaling - rotation - reflection - shearing - composite transformations. Two dimensional viewing - window port, viewport - clipping - point - line - Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Three-Dimensional Geometric Transformations - Translation - Scaling - Rotation - reflection - shearing - affine transforms **(10)**

COMPUTER ANIMATIONS

Raster methods - double buffering - raster operations - morphing - simulating accelerations - motion specifications - character animations - motion capture - OpenGL animation procedures **(8)**

INTRODUCTION TO MULTIMEDIA

Multimedia Applications - Multimedia Systems Architecture - evolving technologies - defining objects - Compression and Decompression - Binary image compression - Color , gray scale, Still-video images - JPEG compression - video Image Compression **(10)**

FILE FORMATS AND MULTIMEDIA I/O

Flich - text format - TIFF - RIFF - MIDI file formats, JPEG DIB, MPEG, AVI file formats. TWAIN - architecture - setting up new WAVE type. Pen Input, Video image display systems, Print output, Image Scanners, Digital Video and Audio, Video images and animation, Full-Motion video. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Donald D. Hearn, M. Pauline Baker, Warren, "Computer Graphics with Open GL",4th Edition, 2010, Prentice Hall. (para 1, para2 & para3)*
2. *Prabhat K. Andleigh, KiranThakrar "Multimedia Systems Design", Prentice - Hall of India Pvt. Ltd. 2007. (para 4 & para 5)*

REFERENCE BOOKS

1. *James D. Foley, Andries Van Dam, Steven K. Feiner, F. Hughes John, "Computer Graphics Principles and Practices in C", Second Edition, Pearson publications.*
2. *Ralf Steinmetz and KlaraNahrstedt, " Multimedia: Computing, Communications and Applications", 2009, Pearson Educations.*

15MSSE10 - IT INFRASTRUCTURE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSPE27, 15MSSPE18

ASSESSMENT : THEORY

COURSE OUTCOME

- *Plan the Strategy to manage the Storage Space for the project*
- *Devise the IT service delivery process based on the customer's requirements*
- *Apply the IT Ethics to handle the privacy and security issues of Software Projects.*

INTRODUCTION

Computing Resources - Information Technology - IT Infrastructure Management. IT Infrastructure: IT Infrastructure Management - Challenges - Design Issues of IT Organizations and IT Infrastructure - Determining Customers' Requirements - IT Systems Management Process - IT Service Management Process - Information Systems Design Process - Patterns of IT Systems Management - IT Infrastructure Library. **(13)**

SERVICE DELIVERY PROCESS

Service Level Management - Financial Management - IT Service Continuity Management - Capacity Management - Availability Management. Service Support Process: Configuration Management - Incident Management - Problem Management - Change Management - Release Management

Storage Management : Backup and Storage - Archive and Retrieve - Disaster Recovery - Space Management - Database and Application Protection - Bare Machine Recovery - Data Retention. **(12)**

SECURITY MANAGEMENT

Computer Security - Internet Security - Physical Security - Identity Management - Access Control Systems - Intrusion Detection

IT Ethics - Intellectual Property - Privacy and Law - Computer Forensics - Ethics and Internet - Cyber Crimes. **(10)**

Emerging Trends in IT: E- Commerce - Electronic Data Interchange - Global System for Mobile

Communications - Bluetooth - Infrared Technology **(10)**

TOTAL : 45

TEXT BOOKS

1. *Phalguni Gupta, Surya Prakash, UmaraniJayaraman, "IT infrastructure and its management", Tata McGraw Hill, Second Print 2010.*
2. *Rich Schiessor, "IT Systems Management", Prentice Hall Professional, January 2010.*

15MSSE11 - BIO-INFORMATICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the basic principles and concepts of biology, computer science and mathematics*
- *Classify tools for representing and analyzing sequences similarity and variations in medical science*
- *Choose mechanisms to support effective approaches for producing robust, exportable software that can be widely shared*
- *Analyze knowledge in bioinformatics with database creation, data analysis and modeling*
- *Develop problem-solving skills, including the ability to develop new algorithms and analysis methods.*

INTRODUCTION

System approach in molecular biology, Central dogma of molecular biology, Important definitions, bioinformatics approach, Applications, European molecular biology network - national center for bio technology information **(7)**

CODING

Common health care language, coding techniques - coded and quasi-coded data - Medical vocabulary - industry wide communication standards HL7 - unified medical language system - quality of care paradigms, risk management bioethics **(8)**

PATIENT RECORD MAINTENANCE

Electronic patient record - models or ERP - environmental services - metrics - telemedicine - community networks - telemedicine peripherals and equipment selection - anatomy of video conferencing technology **(8)**

PROTEIN INFORMATION RESOURCES

Biological data basics - primary and secondary data basics - protein pattern data basics - DNA sequences data basics, DNA analysis, Genes structure and DNA sequences - interpretation of EST structures - different approach to EST analysis **(8)**

ALIGNMENT TECHNIQUES

Data base searching, comparison of two sequences - identity and similarity - global and global similarity - global and local alignment, multiple sequence alignment - data basis of multiple alignments - secondary Database. **(7)**

PROBLEM SOLVING IN BIOINFORMATICS

Gnome analysis for DNA sequences, protein sequences, Strategies and options for similarity search, Practical considerations in sequence analysis, Flow chart for protein structure prediction -Illustrations

(7)

TOTAL : 45

TEXT BOOK

1. *Teresa Attwood, David Parry-Smith, "Introduction to Bioinformatics", Pearson Education, New Delhi, 2001.*

REFERENCE BOOKS

1. *Arthur M. Lesk, "Introduction to Bio-Informatics", Oxford Press, New Delhi, 2004.*
2. *Pierre Baldi, Soren Brunak, "Bioinformatics - The Machine Learning Approach", East-West Press, New Delhi, 2003.*
3. *Rastogi.S.C, NamitaMendiratta, ParagRastogi, "Bioinformatics - Concepts, Skills, Applications", CBS Publications & Distributors, New Delhi, 2003.*

15MSSE12 - ACCOUNTING AND FINANCIAL MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a set of business transactions, prepare books of accounts and verify correctness using trial balance, for any business organization*
- *For a given trial balance, prepare statements of financial accounting to ascertain the profit, for any trading or manufacturing organization*
- *For the given production and cost data, Perform Cost estimation and determine the optimum units of products for a firm using CVP analysis and Marginal Costing Techniques*
- *Prepare Financial statements using ratio analysis, budgeting, working capital management, capital budgeting and budgetary control Techniques and present facts to assist in strategic decision making, given a set of investment options for a business*
- *Develop software solutions to automate a given accounting, costing or financial process, using MS-Excel*

FINANCIAL ACCOUNTING

Introduction - Definition, need, merits, demerits, stakeholders. Principles of financial accounting - concepts, conventions. Types of Accounting - Financial, Cost, Management. Types of Accounts - Principles ofDouble Entry book keeping. Procedure for accounting - Journal - Ledger - Trial Balance **(10)**

FINAL ACCOUNTS

Final Accounts - method of preparation - Manufacturing/Trading Account - Profit and Loss Account - Balance sheet format - classification of Assets and Liabilities. Final accounts - without and with adjustments-adjustments for provision. Depreciation - theory - methods of calculating depreciation. **(8)**

COSTING AND ANALYSIS OF COSTING

Introduction - definition - costing methods - techniques - Classification of costs - Cost curves - Cost sheet analysis - statement of cost - specimen format. Marginal costing and Cost Volume Profit Analysis - meaning - objectives - marginal cost equation - contribution - break even point - break even chart - P/V Ratio - Margin of Safety - Combined break even point - Cash break even point. **(8)**

BUDGETING AND BUDGETARY CONTROL

Definition - Essentials - difference between budgeting and forecasting.Budgetary Control - objectives - scope - requisites for effective Budgetary Control.Organization for budgetary control - Budget officer -

Budget chart - Budget Committee - Budget Manual - Budget Period - advantages - limitations. Basis of classification of budgets. Functional Budgets - material purchase, labour, Overhead, flexible overhead rate budget, fixed overhead budgets, production and production cost, sales budget, cash budget, budget ratios. **(8)**

FINANCIAL STATEMENTS ANALYSIS AND INTERPRETATION

Financial statements - nature - objective - limitations. Methods and Analysis of Financial Statements - Ratio analysis - Profitability ratios - turnover ratios - Liquidity ratios - leverage ratios - Working capital Management - theory - Capital Budgeting - Methods of Investment Decision - ARR - pay-back period -IRR - NPV. **(11)**

TOTAL : 45

TEXT BOOK

1. *Dr. S.N. Maheshwari, "Principles of Management Accounting Vol I and II", S. Chand & Company Ltd, Seventeenth Revised Edition 2012.*

REFERENCE BOOKS

1. *I M Pandey "Financial Management", 10th Edition Vikas Publishing House Pvt. Ltd.*
2. *Sharma R K, Shashi K Gutpa, "Management Accounting and Financial Management", Kalyani Publishers, 1996.*

15MSSE13 - GEOGRAPHIC INFORMATION SYSTEM

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Differentiate the concepts of geographic information systems from other types of information systems*
- *Use modern industry-standard GIS software for conducting basic GIS analysis and producing cartographic output*
- *Apply GIS analysis to address geospatial problems*
- *Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis*

INTRODUCTION

Systems, Sciences and Society - Applications **(9)**

PRINCIPLES

Nature of Geographic Data - Representing Geography - Geo referencing - Uncertainty - The GeoWeb **(9)**

TECHNIQUES

GI System software - Geographic modeling - GIS Data collection - Creating and maintaining Geographic databases- Geo Web **(9)**

ANALYSIS

Cartography and Map Production - Geovisualization - Spatial Data Analysis - Spatial Analysis and Inference- Spatial Modeling with GI System **(9)**

MANAGEMENT AND POLICY

Managing GI Systems - Information and Decision making - The Risks **(9)**

TOTAL : 45

TEXT BOOK

1. *Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., "Geographic Information Systems and Science", New York, John Wiley & Sons, 2015.*

REFERENCE BOOK

1. *Gorr and Kurland, "GIS Tutorial: Basic Workbook 1", ESRI Press, 2011.*

15MSSE14 - DESIGN THINKING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze and determine the drivers and target groups of the given problem*
- *Generate an idea for addressing the issues based on the problem study*
- *Design and Present the creative ideas in an understandable way using appropriate methods*
- *Modify the generated ideas based on thinking in visual forms*
- *Develop the prototype for the generated idea and implement it using appropriate techniques*

OVERVIEW OF DESIGN PROCESS

Stages of thinking: The design process - Define - Research - Ideate - Prototype - Select-Implement-Learn - Example project. Research-Identifying drivers - Information gathering - Target groups - Samples and Feedback **(10)**

IDEA GENERATION

Basic design directions- Themes of thinking - Inspiration and references-Brainstorming -Value - Inclusion - Sketching -Presenting ideas **(12)**

REFINEMENT

Thinking in images - Thinking in signs - Appropriation - Humour - Personification - Visual metaphors - Modification - Thinking in words - Words and language - Thinking in shapes - Thinking in proportions - Thinking in color **(12)**

PROTOTYPING AND IMPLEMENTATION

Prototyping: Developing of designs - Types of prototype - Vocabulary. Implementation: Format - Materials-Finishing - Media-Scale - Series. **(11)**

TOTAL : 45

TEXT BOOK

1. *Gavin Ambrose and Paul Haris, "Basic Design 08 Design Thinking", AVA Publishing, 2010.*

15MSSE15 - BUSINESS PROCESS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Discover the processes associated with the given business problem*
- *Analyze the business process and identify the issues of the process.*
- *Design the business process by applying the necessary changes.*
- *Develop the IT solution to automate the business process*
- *Infer Business Process Management as a cross-disciplinary field, striking a balance between business management and IT aspects*

INTRODUCTION TO BUSINESS PROCESS MANAGEMENT (BPM)

Business Process Definition - Origin and History of BPM - The BPM Lifecycle **(7)**

PROCESS IDENTIFICATION AND MODELING

Focusing on Key Processes - Designing a Process Architecture - BPMN Initiation - Branching and Merging - Information Artifacts - Resources. **(9)**

ADVANCED PROCESS MODELING

Process Decomposition - Process Reuse - Rework and Repetition - Handling Events - Handling Exceptions - Processes and Business Rules. **(10)**

PROCESS DISCOVERY

The Setting of Process Discovery - Discovery Methods - Process Modeling Method - Process Model Quality Assurance. **(9)**

PROCESS ANALYSIS AND REDESIGN

Qualitative Process Analysis: Value-Added Analysis - Root Cause Analysis - Issue Documentation and Impact Assessment. Quantitative Process Analysis: Performance Measures - Flow Analysis - Queues - Simulation. Redesign: Definition and Need - Heuristic Process Redesign - The Case of a Health Care Institution - Product-Based Design. **(10)**

TOTAL : 45

TEXT BOOK

1. *Marlon Dumas, Marcello La Rosa, Jan Mendling and Hajo A. Reijers, "Fundamentals of Business Process Management", Springer-Verlag Publication, 2013.*

REFERENCE BOOK

1. *Forrest W. Breyfogle III, " The Business Process Management Guidebook: An Integrated Enterprise Excellence BPM System", Citius Publishing, 2013.*

15MSSE16 - HUMAN RESOURCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *State the foundations of Human Resource Management*
- *Explain the various techniques of Human Resource Management*
- *Discuss the problems in organizations in managing people*
- *Give examples:-- Give example case studies of organizations facing issues on Human Resources*
- *Generalize the procedures for best human resource practices*

INTRODUCTION

HRM - definition, features, Model, Objectives, Importance, System Approach. History - Origin and growth of personnel functions in India - factors impeding the growth of HR Management - Role of HR professional - Future HTM in India. **(6)**

PLANNING, RECRUITMENT AND TRAINING

Need for HR planning, - Integrated strategic vs HR planning - significance - nature - planning at different levels - process - limitations - guideline for making planning effective - responsibilities - HRIS - HR forecast. Recruitment - definition, sources, policy. Selection - definition, steps in selection procedure - interview process. Training - meaning and purpose, importance - benefits to - organization, employees - types of training. Executive development - need, importance, objective, methods. **(10)**

PERFORMANCE

Appraisal - definition, objectives, use, purpose, process and essentials of good appraisal system. Methods or techniques of Performance Appraisal. Post appraisal analysis. Counselling and monitoring - definition, characteristics, need, causes, functions - mentoring. Motivation - nature, importance, types. Requirements for a sound motivation system. Morale - wage incentive schemes. **(10)**

INFORMATION SYSTEM AND AUDITING

HR Records - objective, significance, purpose. Essentials of Good HR Record. Fundamental principles of record keeping. Essentials of good report. Human Resource Information System - information needs in HRM - objectives - Personnel inventory. Definition of HR accounting - objectives - methods of HR valuation - Human capital reporting - controlling costs. **(9)**

RESEARCH AND POLICIES

Personnel Research - Meaning and Characteristics - objectives - techniques and tools.

Developing HR policies - Factors influencing HR Policies - Essential Characteristics of Sound HR Policies - principles and types. Employee welfare - Employee Discipline - grievances handling - Collective Bargaining. Current Issues and Trends in HRM. **(10)**

TOTAL : 45

TEXT BOOK

1. *P.G Aquinas "Human Resource Management - Principles and Practice" ,Reprint, Vikas Publishing House Pvt. Limited, 2011.*

REFERENCE BOOKS

1. *M N Mishra, "Organizational Behaviour", Vikas Publishing House Pvt. Limited, 2010.*
2. *Alan Price, "Principles of Human Resource Management: An Active Learning Approach", Paperback (June 2000) Blackwell (Oxford).*

15MSSE17 - INTERNETWORKING PROTOCOLS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an inter-network topology configuration, can demonstrate how a packet reaches the destination*
- *Given a protocol of TCP/IP stack, explain how the protocol is used in forwarding the packets across networks.*
- *Given the assigned addresses, able to design an inter-network utilizing the given set fully.*
- *Given a protocol implementation, analyze and identify the possible threats and specify solutions*
- *Given a network topology with internetworking devices, demonstrate how the devices obtain their network configuration*

INTRODUCTION

Architectural Principles - Design and Implementation- The Architecture and Protocols of the TCP/IP Suite. The Internet Address Architecture: Basic IP Address Structure - CIDR and Aggregation - Special-Use Addresses - Unicast Address Assignment- Attacks Involving IP Addresses. **(9)**

LINK LAYER

Ethernet - Full Duplex, Power Save, Auto-negotiation, and 802.1X Flow Control - Bridges and Switches - Wireless LAN- Point-to-Point Protocol - Loopback - tunneling - Attacks on the Link Layer. **(8)**

INTERNET LAYER

Address Resolution Protocol : Operation and frame Format - Internet Protocol: Introduction - IPv4 and IPv6 Headers - IPv6 Extension Headers - IP Forwarding - Mobile IP - Host Processing of IP Datagrams - Attacks Involving IP - System configuration : DHCP and Auto configuration. Internet control Message Protocols: ICMPv4 and ICMPv6 Broadcasting and Local Multicasting. **(9)**

TRANSPORT LAYER

User Datagram Protocol: Header - checksum - UDP and IPv6 - UDPLite - Translating UDP/IPv4 and UDP/IPv6 Datagrams - Name resolution and Domain Name system. Transmission Control Protocol: Introduction - connection management - TCP Timeout and Retransmission - TCP data flow and window management - classic congestion control algorithms. **(8)**

APPLICATION LAYER

HTTP - DNS - E Mails - SNMP **(11)**

TOTAL : 45

TEXT BOOKS

1. *Kevin R. Fall, W. Richard Stevens, "TCP/IP Illustrated, Volume 1", Pearson Education, 2nd edition, 2012.*
2. *James F Kurose, "Computer networking: A top-down approach Featuring the Internet", 3rd edition, Pearson Education, 2006*

REFERENCE BOOKS

1. *Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGRAW-HILL edition, 4th edition, 2009*
2. *Ed Tittel, Laura Chappell,Guide to TCP/IP, Cengage Learning, Third Edition 2006.*
3. *Douglas E. Comer, "Internetworking with TCP/IP- Volume One", 6th Edition, Addison-Wesley, 2013.*

15MSSE18 - DISTRIBUTED COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS33, 15MSS45, 15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the hardware and software concepts needed for distributed system model*
- *Compare Remote Procedure Call and Remote Method Invocation from the perspective of developing distributed applications*
- *Describe the role of the components of distributed Operating System*
- *Explain the concurrency control mechanism for distributed transactions*

INTRODUCTION

Definition, Goals, Hardware Concepts, Software Concepts, The Client-Server Model. **(4)**

COMMUNICATION

Layered Protocols, Remote Procedure Call, Remote Object Invocation - Java RMI - Distributed Objects - The Roles of Client and Server, Remote Method Calls, The RMI Programming Model, Parameters and Return Values in Remote Methods, Remote Method Activation. Message-Oriented Communication, Stream-Oriented Communication. **(12)**

PROCESSES

Threads, Clients, Servers, Code Migration, Software Agents, Naming - Naming Entities, Locating Mobile Entities, Removing Unreferenced Entities **(10)**

SYNCHRONIZATION

Clock Synchronization, Logical Clocks.Distributed Transactions.Consistency and Replication - Introduction, Distributed Protocols. **(12)**

EXAMPLES OF DISTRIBUTED SYSTEMS

CORBA, Sun Network File System, Jini. **(7)**

TOTAL : 45

TEXT BOOKS

1. *Distributed Systems - Principles and Paradigms, Andrew S. Tanenbaum, Maarten van Steen, Prentice Hall of India, 2007*
2. *Core Java - Volume II - Advanced Features, Cay S.Horstmann, Gary Cornell, Eighth Edition, Prentice Hall, 2008*

15MSSE19 - SOA AND WEB SERVICES

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS45, 15MSSPE3, 15MSS61

ASSESSMENT : THEORY

COURSE OUTCOME

- *Examine the requirements of distributed applications and design web services*
- *Apply the concepts of Service Oriented Architecture in designing platform independent real time distributed applications*
- *Design and develop simple to complex web services that meet the specified requirements*
- *Develop web services based on requirements of the web application using Java APIs and also consume them in web applications*
- *Determine the security requirements of web services and incorporate them in building web application*

INTRODUCTION TO SOA

Fundamental SOA - Common Characteristics of Contemporary SOA - Evolution of SOA **(7)**

WEB SERVICES AND SOA

The Web Service Framework - Services - Service Descriptions - Messaging - Message Exchange Patterns - Service Activity: Coordination; Atomic Transactions; Business Activities; Orchestration; Choreography. **(10)**

SOA AND SERVICE-ORIENTATION

Anatomy of a Service-Oriented Architecture - Common Principles of Service-Orientation and Their Inter-Relationships - Service Layers **(8)**

BUILDING SOA

Service Oriented Analysis: Introduction, Guidelines - Service Oriented Design: Introduction, WSDL-Related XML Schema Language, WSDL Language Basics, SOAP Language Basics, SOA Composition Guidelines, Service Design Overview, Business Process Design: WS-BPEL Languages Basics, WS-Coordination Overview, Service-Oriented Business Process Design-WS-Security Language Basics. **(10)**

WEB SERVICES IN JAVA

Building Web Services with JAX-WS - Binding between XML Schema and Java Classes - Streaming APIfor XML - SOAP with Attachments API for Java - Generating Client-Support Code from a WSDL - Building RESTful Web Service with JAX-RS. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Thomas Eri, "Service-Oriented Architecture- Concepts, Technology and Design", Pearson Education, Second Edition, 2008*
2. *Eric Jendrock, Jennifer Ball, Debbie Carson, Ian Evans and Kim Haase, "The Java EE5 Tutorial", Oracle Corporation Press, 2010*
3. *Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, Devika Gollapudi, Kim Haase, William Markito and Chinmayee Srivarthsa, "The Java EE6 Tutorial", Oracle Corporation Press, 2013*
4. *Martin Kalin,"Java Web Services: Up and Running", O'Reily Media Inc., First Edition, 2009.*

15MSSE20 - CLOUD COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS22, 15MSS32, 15MSS33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose the technologies required to perform scalable and distributed computing over the Internet.*
- *Recognize the levels and mechanisms of resource virtualization applicable for scalable computing.*
- *Compare the service models offered by different service providers and choose appropriate platform for implementing cloud computing solution considering management, security and trust requirements.*
- *Use suitable programming tools and platform to develop and deploy applications on cloud environment.*
- *Demonstrate the cloud enabling technologies for ubiquitous computing through case studies related to social and professional networking.*

DISTRIBUTED SYSTEM MODELS AND ENABLING TECHNLOGIES

Scalable Computing over the Internet - Technologies for Network-based Systems - System Models for Distributed and Cloud Computing - Software Environments for Distributed Systems and Clouds - Performance, Security, and Energy Efficiency **(9)**

CLUSTERS, VIRTUALIZATION AND DATA CENTERS

Clustering for Massive Parallelism - Computer Clusters and MPP Architectures - Design Principles of Computer Clusters - Implementation Levels of Virtualization - Virtualization Structures/Tools and Mechanisms - Virtualization of CPU, Memory, and I/O Devices - Virtual Clusters and Resource Management **(9)**

CLOUD PLATFORM ARCHITECTURE

Cloud Computing and Service Models - Architectural Design of Compute and Storage Clouds - Public Cloud Platforms: GAE, AWS and Azure - Inter - Cloud Resource Management - Cloud Security and Trust Management **(9)**

SOFTWARE ENVIRONMENTS FOR CLOUD PROGRAMMING

Services and Service-Oriented Architecture - Message Oriented Middleware -Features of Cloud and Grid Platforms - Parallel and Distributed Programming Paradigms - Programming Support of Google AppEngine - Programming on Amazon AWS and Microsoft Azure - Emerging Cloud Software Environments. **(9)**

UBIQUITOUS CLOUDS AND INTERNET OF THINGS

Case Studies: Cloud Trends in Supporting Ubiquitous Computing - Performance of Distributed Systems and the Cloud - Enabling Technologies for the Internet of Things - Innovative Applications of the Internet of Things - Online Social and Professional Networking **(9)**

TOTAL : 45

TEXT BOOK

1. *Kai Hwang, Geoffrey C.Fox, Jack J Dongarra, "Distributed and Cloud Computing", Morgan Kaufmann Publishers, Elsevier, 2012*

REFERENCE BOOKS

1. *Chris Wolf, Erick M. Halter, "Virtualization: From the Desktop to the Enterprise", Apress Series 2005.*
2. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005*
3. *Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, "Cloud Computing - A practical Approach", Tata McGrawHill, 2010*

15MSSE21- PARALLEL COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.*
- *Given a problem, develop an efficient parallel algorithm to solve it.*
- *Given a parallel algorithm, analyze its time complexity as a function of the problem size and number of processors*
- *Given a parallel algorithm, an input to it, and the number of processors, show the steps performed by that algorithm on that input.*
- *Given a parallel algorithm, develop message-passing parallel programs with MPI*

PARALLEL COMPUTING : Motivation - Scope

PARALLEL PROGRAMMING PLATFORMS

Implicit Parallelism - Limitations of Memory System Performance - Dichotomy - Physical Organization - Communication Costs - Routing Mechanisms for Interconnection Networks - Impact of Process-Processor Mapping and Mapping Techniques **(9)**

PRINCIPLES OF PARALLEL ALGORITHM DESIGN

Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Models **(9)**

BASIC COMMUNICATION OPERATIONS

One-to-All Broadcast and All-to-One Reduction - All-to-All Broadcast and Reduction - All-Reduce and Prefix-Sum Operations - Scatter and Gather - All-to-All Personalized Communication - Circular Shift - Improving the Speed of Communication Operations. **(9)**

ANALYTICAL MODELING OF PARALLEL PROGRAMS

Sources of Overhead - Performance Metrics - Scalability of Parallel Systems - Execution Time and Cost-Optimal Execution Time - Asymptotic Analysis of Parallel Programs - Other Scalability Metrics **(9)**

PROGRAMMING USING THE MESSAGE-PASSING PARADIGM

Principles of Message-Passing Programming - MPI: the Message Passing Interface - Topologies and Embedding - overlapping communication and computation - Collective communication and computation operations. **(9)**

TOTAL : 45

TEXT BOOK

1. *AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel computing", Pearson Education, 2012.*

REFERENCE BOOKS

1. *M.J. Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw-Hill, 1st Edition, 2003.*
2. *Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kaufmann, 2011.*

15MSSE22 - SOFTWARE DEFINED NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Explain how historical switching and networks work and the need for SDN*
- *Describe the key benefits of SDN, which are brought by the separation of data and control planes*
- *Describe the working of SDN control plane*
- *Describe the working of SDN Data plane*
- *Describe techniques to enable applications to control the underlying network using SDN*

INTRODUCTION

Basic packet-switching Technology - Modern Data Center - Switch architecture - Need for SDN - Genesis of SDN. **(9)**

CONTROL AND DATA PLANES

Centralized and distributed control and Data planes - OpenFlow - SDN Controllers: General Concepts - Plexxi - CoscoOnePK **(9)**

Network programmability - Data Center concepts and constructs: Multitenant Data Center - virtualized Multitenant data center - SDN solutions for the Data Center Network **(9)**

Network Function virtualization - Network Topology and Topological Information - Building an SDN framework **(9)**

USE CASES

Bandwidth scheduling, Manipulation, and calendaring - Data Center overlays, Big Data, and Network Function Virtualization - Traffic Monitoring, Classification and Triggered actions. **(9)**

TOTAL: 45

TEXT BOOK

1. *Thomas D. Nadeau and Ken Gray, " SDN: Software Defined Networks", 1st Edition, O'Reilly, 2013.*

REFERENCE BOOKS

1. *Paul Goransson and Chuck Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, 2014.*
2. *William Stallings, "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud", Pearson Education, 2016.*

15MSSE23 - AUTONOMIC COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an autonomous system, can describe how a system adapts itself to dynamic needs*

INTRODUCTION

Software Complexity - Software Development cycle - Maintenance challenges - Autonomic computing - Motivation - Self.* properties and qualities - Benefits, Challenges and Degrees of Autonomy - Similar Initiatives, current status and Relation to Software Engineering -Sources of Inspiration: Influences - Biology - Control System - Artificial Intelligence **(10)**

ARCHITECTURES

Autonomic Elements - Architecture of Autonomic Elements - Autonomic Manager Reference Architecture - Architecture with Multiple Autonomic Elements.

Monitoring Function: Performance Monitoring - Monitoring Overheads - Profiling - Building probes - Examples of Monitoring tools - Monitoring the Monitors. **(12)**

ADAPTATION FUNCTION

Software Adaptation - Code adaptation - OSGi - iPOJO.

Decision Function: Knowledge - Knowledge in Autonomic computing - Model Driven Autonomicity - Reasoning Techniques **(11)**

EVALUATION ISSUES

Evaluation Elements - Evaluation metrics for Emergent System.

Autonomic Mediation in Cilia: Software Integration - Cilia - Autonomic Cilia - Autonomic Life-cycle management of Cilia chains **(12)**

TOTAL : 45

TEXT BOOK

1. *Lalanda, Philippe, McCann, Julie A. and Diaconescu, Ada, "Autonomic Computing: Principles, Design and Implementation", Springer Book Series, 2013.*

REFERENCE BOOKS

1. *Richard Murch, "Autonomic Computing", IBM Press, March 2004.*
2. *Yan Zhang, Laurence Tianruo Yang and Mieso K. Denko, "Autonomic Computing and Networking", Springer Book Series, 2009.*

15MSSE24 - REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS33, 15MSS44,15MSS53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given the requirements and timing constraints, develop hard and soft real time systems*
- *Given the requirements and timing constraints, choose appropriate scheduling algorithm to meet the requirements and justify the selection.*
- *For a given set of requirements, develop real-time applications exploiting the features of the given Real-Time operating system.*
- *For a given requirements, compare the real-time communication protocols and choose one to meet the timing constraints.*
- *Re-cast practical design problems into real time task models for the purpose of analysis, evaluation or implementation*

INTRODUCTION

Real-Time Scheduling: characteristics of Real-Time tasks - Task Scheduling - Clock driven - Event-Driven -Rate Monotonic algorithm **(9)**

RESOURCE SHARING AND SCHEDULING

Resource Sharing among Real-Time Tasks - Scheduling Real-Time Tasks in Multiprocessor and Distributed systems: Multiprocessor task allocation - Dynamic allocation of Tasks - Centralized and Distributed Clock synchronization **(9)**

REAL-TIME OPERATING SYSTEMS

Time Services - Feature of RTOS - UNIX as a RTOS - UNIX based RTOS - VxWorks. **(9)**

REAL-TIME COMMUNICATIONS

Real-Time communication in LANs - Soft Real-Time and Hard real-time communication in LANs - Bounded Access Protocols for LANs - Real-Time communication over packet switched Networks - Routing - Resource Reservation - Rate Control - QoS Models. **(9)**

REAL-TIME DATABASES

Example Applications - Real-Time Database Application design issues - Characteristics of Temporal data - Concurrency Control in Real-Time Data bases - Commercial Real-Time Databases **(9)**

TOTAL : 45

TEXT BOOK

1. *Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.*

REFERENCE BOOKS

1. *Jane W. Liu, "Real-Time Systems", Pearson Education, 2001.*
2. *Krishna and Shin, "Real-TIme Systems", Tata McGraw Hill. 1999.*

15MSSE25 - ANALYSIS AND DESIGN OF REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a real-time application, can apply real-time extensions to software requirements analysis.*
- *Given the real-time requirements of a system, analyse, design and implement a small scale real-time system*
- *Evaluate the implications of design choices on real time system implementation*
- *Given a real-time solution, can analyze the performance and can optimize the solution*

REQUIREMENTS

Requirements Engineering for Real-Time Systems - Formal Methods in System Specification - Semiformal Methods in System Specification - The Requirements Document. **(9)**

DESIGN

Software Design Approaches - Software Engineering Principles - Procedural Design Approach - Object-Oriented Design Approach - Life Cycle Models. **(9)**

ANALYSIS

Performance Analysis Techniques - Applications of Queuing Theory - Input/ Output Performance - Analysis of Memory Requirements. **(9)**

Metrics - Predictive Cost Modeling - Uncertainty in Real-Time Systems - Design for Fault Tolerance - Software Testing and Systems Integration - Performance Optimization Techniques. **(9)**

CASE STUDY

Software Requirements Specification - Designing Real - Time Software - Future Visions on Real - Time Systems. **(9)**

TOTAL : 45

TEXT BOOK

1. *Phillip Laplante, "Real-Time Systems Design and Analysis", Wiley-IEEE Press, 2012.*

REFERENCE BOOK

1. *Alan C. Shaw, “Real-Time Systems and Software”, Wiley, 2001.*

15MSSE26 - EMBEDDED PROCESSORS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS32, 15MSS43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given PIC Microcontroller architecture, describe PIC registers, data format and directives*
- *Develop ALP and embedded C programs using PIC Microcontroller instruction set.*
- *Develop ALP and C programs using appropriate PIC microcontroller timer, counter and serial port*
- *Design embedded software based on timer, external hardware and serial communication interrupts*

PIC MICROCONTROLLER

History and features - Microcontrollers and Embedded processors - Overview of PIC18 family - PIC architecture and Assembly language programming: WREG register - File register - Status register - Data format and directives - program counter and program ROM space - RISC architecture - PIC Assembly programming **(11)**

PIC18 INSTRUCTIONS AND ASSEMBLY LANGUAGE PROGRAMMING

Branch, Call and Time delay loop - PIC I/O Port programming - Arithmetic and Logic instructions - Programs - Bank switching - Table processing - macros - modules. **(9)**

PIC18 PROGRAMMING IN C

Data types and time delays - I/O programming - Logic operations - Data serialization - Program ROM allocation - Data RAM allocation in C18 **(9)**

PIC18 TIMER AND SERIAL PORT PROGRAMMING

Programming timer0, timer1, timer2 and timer3 - counter programming - basics of serial communication - PIC18 serial port programming in assembly and C. **(8)**

PIC18 INTERRUPT PROGRAMMING

PIC18 interrupts - programming timer interrupts - programming external hardware interrupts - programming serial communication interrupts - PortB change interrupt - Interrupt priority in PIC18 **(8)**

TOTAL : 45

TEXT BOOK

1. *Muhammad Ali Mazidi, Rolin D. Mckinlay and Danny Causey "PIC Microcontroller and Embedded Systems using Assembly and C for PIC18", Pearson Prentice Hall, 2008.*

REFERENCE BOOKS

1. *R. Barnett, L O' Cull and S. Fox, "Embedded C Programming and The Microchip PIC", Thomson, 2004.*
2. *Barry B. Brey, "Applying PIC18 Microcontrollers: Architecture, Programming, and Interfacing Using C and Assembly", Prentice Hall, 2007.*
3. *Sid Katzen, "The Essential PIC18 Microcontroller", Springer, 2010.*
4. *Microchip Technology Data Sheet for PIC18.*

15MSSE27 - COMPUTER VISION

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and use the vision technology in conjunction with real world applications*
- *Detecting features, discuss feature correspondences across different images and review image segmentation techniques like Active contours, Split and merge, Mean shift and mode finding*
- *Investigate techniques like shading and focus, merging multiple range or depth images into 3D models, and reconstructing them.*
- *Perform pose estimation, camera's intrinsic calibration, estimate 3D point structure from 2D matches, 3D geometry, camera motion and the motion between two or more images.*
- *Reconstructing the 3D shape of a scene from images taken from different views.*

INTRODUCTION, IMAGE FORMATION AND FILTERING

What is computer vision?, Photometric image formation, The digital camera, Point operators, Linear filtering, neighbourhood operators, Fourier transforms, Pyramids and wavelets. **(9)**

FEATURE DETECTION AND SEGMENTATION

Feature Detection: Points and patches, Edges, Lines.

Segmentation: Active contours, Split and merge, Mean shift and mode finding **(8)**

3D RECONSTRUCTION

Shape from X, Active range finding, Surface representations, Point-based representations, Volumetric representations, Model-based reconstruction, Recovering texture maps and albedos. **(8)**

MOTION ESTIMATION

Feature-based alignment: 2D and 3D feature-based alignment, Pose estimation, Geometric intrinsic calibration.

Structure from motion: Triangulation, frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion.

Dense motion estimation: Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion. **(12)**

RECOGNITION

Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding. **(8)**

TOTAL : 45

TEXT BOOK

1. *Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer-Verlag London Limited 2011.*

REFERENCE BOOKS

1. *Forsyth, D. and Ponce, J, "Computer Vision: a modern approach", Prentic Hall, 2002.*
2. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2008.*
3. *Rafael C.Gonzalez, Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", First Edition, Pearson Education, 2004.*

15MSSE28 - SENSING AND SENSORS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an application, identify the sensors needed to meet the given requirements*
- *Given a sensor, give examples depicting its use to meet a requirement*
- *Given a sensor, determine the calibration points to satisfy the requirements.*
- *Given the sensing requirements, design circuits to interface sensor to the system to meet the requirement*
- *For a given sensor, derive transfer function for the sensor from the specification sheet*

SENSOR CHARACTERISTICS

Introduction - Transfer Function - Calibration - Computation of Stimulus - Static and Dynamic characteristics and errors **(7)**

PHYSICAL PRINCIPLES OF SENSING

Electric Charges, Fields, and Potentials - Magnetism - Induction - Resistance - Piezoelectric Effect - Pyroelectric Effect - Hall Effect - Sound Waves - Temperature and Thermal Properties of Materials - Heat Transfer - Light - Dynamic Models of Sensor Elements **(11)**

INTERFACING SENSORS TO THE SYSTEM

Optical Components of Sensors - Interface Electronic Circuits **(8)**

DYNAMIC CHARACTERISTICS MEASUREMENT

Occupancy and Motion Detectors - Position, Displacement and Level Detectors - Force, Strain and Tactile sensors **(10)**

RADIATION AND CHEMICAL SENSORS

Radiation Detectors: Scintillating Detectors - Ionization Detectors - Cloud and Bubble Chambers - Chemical Sensors: Characteristics - classes - Biochemical sensors - Multisensor arrays - Difficulties **(9)**

TOTAL : 45

TEXT BOOK

1. *Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", 4th Edition, Springer, 2010.*

REFERENCE BOOKS

1. *John Vetelino and Aravind Reghu, "Introduction to Sensors", CRC press, 2011.*
2. *D. Patranabi, "Sensors and Transducers", PHI,2003.*

15MSSE29 - MECHANICS OF ROBOTIC MANIPULATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To understand Velocities, Static force and Singularities*
- *To know about Dynamic Equation-Computational considerations.*
- *To analyze the robotic Force Analysis and Design*
- *To learn the applications Mechatronics and Automation Applications*
- *To evaluate the locomotion strategies in Determining Locations during Locomotion-Motion Control*

MANIPULATOR KINEMATICS

Introduction - Link Description - Link Connection Description - Convention for Affixing Frames to Links - Actuator , Joint and Cartesian Space - Frames with Standard Names - Computational Considerations of Industrial Robot PUMA 560 - Forward and Inverse Kinematics of Manipulators with Velocities , static force and Singularities. **(9)**

MANIPULATOR DYNAMICS

Introduction- Mass Distribution -Newton's Equation -Euler's Equation - Structure of a Manipulator's Dynamic Equation -Computational Considerations. **(8)**

MANIPULATOR CONTROL

Stepper Motor - Principle of Operation - Drive Circuit - Interfacing with a Microprocessor - Drive Mechanisms - Rack and Pinion Movement - Ball Screens - Gear Trains - Harmonic Drive Robot End - Effectors - Introduction - Classification of End Effectors -Drive System for Grippers - Mechanical Grippers -Force Analysis and Design. **(9)**

COMPUTER INTERFACING AND FLEXIBLE AUTOMATION IN MANIPULATION OF ROBOTS

Components - Mechatronics and Automation Applications - Basic Structure of PLC (Programmable Logic Controllers) - Example Loading and Unloading Parts by a Robot -Activity Chart-Modeling Development of Actuators and Sensors using MEMS Technology. **(9)**

ROBOT PROGRAMMING FOR LOCOMOTION

Robot Languages - WAVE and AL, VAL , AML ,MCL, RAIL, HELP,JARS,RPL, Autopass - Classification of Robot Languages -Computer Control and Robot Software - VAL System and Language - Trajectory Control - Monitor Commands - Determining Locations during Locomotion -Motion Control. **(10)**

TOTAL : 45

TEXT BOOKS

1. *S.R. DEB / S. DEB, "Robotics Technology and Flexible Automation" McGraw - Hill Professional, 2nd Edition, 2011.*
2. *John J.Craig," Introduction to Robotics - Mechanics and Control" Pearson, Third Edition, 2013.*

REFERENCE BOOKS

1. *Robert J.Schilling, "FUNDAMENTALS OF ROBOTICS-Analysis & Control" PHI Learning, Indian Edition. 2010.*
2. *Mickell P Groover et al. "INDUSTRIAL ROBOTICS" McGraw Hill Education, Second Edition. 2012.*
3. *Reza N. Jazar, "THEORY OF APPLIED ROBOTICS - Kinematics, Dynamics, and Control" Springer International Edition First Indian Reprint. 2010.*

15MSSE30 - ADVANCED DATABASE CONCEPTS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Outline the influence of Data Base Systems on the centralized, Client/Server and Parallel and Distributed Computer System Architecture*
- *Apply variety of Parallelization techniques including I/O parallelism, inter query and intra query parallelism, inter operation and intra-operation parallelism.*
- *Analyse the issues of data base design, transaction management, query evaluation and optimization in the context of distributed databases, heterogeneous data base and cloud based data bases.*
- *Construct Object based database, object relational data base, spatial and temporal database*
- *Use XML in exchange and storage of complex data.*

DATABASE-SYSTEM ARCHITECTURES

Centralized and Client -Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types.

Parallel Databases : Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors

Distributed Databases : Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability Heterogeneous Distributed Databases, Cloud-Based Databases **(12)**

SPECIALITY DATABASES

Object-Based Databases - Overview, Complex Data Types, Structured Types and Inheritance in SQL,Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL,Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational **(9)**

XML- Motivation, Structure of XML Data, XML Document Schema, Querying and Transformation,

Application Program Interfaces XML, Storage of XML Data, XML Applications **(5)**

SPATIAL AND TEMPORAL DATA AND MOBILITY

Motivation, Time in Databases, Spatial and Geographic Data Multimedia Databases, Mobility and Personal Databases **(6)**

NoSQL: Why NoSQL?, Aggregate Data Models, More Details on Data Models, Distribution Models, Consistency, Version Stamps, Map-Reduce

Implementation : Key-Value Databases, Document Databases **(13)**

TOTAL : 45

TEXT BOOKS

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010.*
2. *Pramodkumar J. Sadalage and Martin Fowler. "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison Wesley Professional,1st Edition, 2012.*

REFERENCE BOOK

1. *Ramez Elmasri, Shamkant B. Navathe Durvasula, V.L.N. Somayajulu, Shyam K. Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006*

15MSSE31 - DATA MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate the need for data preprocessing and suggest appropriate methods to produce proper data sources for mining.*
- *Analyze the suitability of design technique to find mining solution with efficient time, cost and memory requirement.*
- *Interpret optimized decisions by employing the mining concepts in business intelligence problems.*
- *Construct a legitimate mining solution with the help of design technique guidelines and validate the suitability of the techniques applied.*
- *Devise efficient managerial decisions based on mathematical models for real time business intelligence applications*

INTRODUCTION

Definition and need of data mining - Kinds of data and patterns - Applications and Issues. Types of data: Data objects and attribute types - Measuring data similarity and dissimilarity. Data Preprocessing: Overview - Data cleaning - Data integration - Data reduction - Data transformation and Data discretization. **(16)**

DATA MINING TECHNIQUES

Mining Frequent Patterns and Associations: Basic concepts - Frequent item set mining methods.

Classification and Prediction: Basic concepts - Decision tree induction - Bayes classification methods. Prediction: Linear and Non-linear regression - Accuracy and error measures.

Cluster Analysis : Basic concepts and methods - Partitioning methods. Hierarchical methods : Agglomerative and Divisive hierarchical clustering and BIRCH. **(10)**

DATA MINING TRENDS

Mining Sequence data - Mining other kinds of data - Visual and Audio data mining - Web mining **(6)**

DATA MINING FOR BUSINESS INTELLIGENCE APPLICATIONS

BI-definition-Effective and timely decisions-data, information and knowledge-role of mathematical models-BI architectures. Applications: Balanced Scorecard, Fraud Detection, Clickstream Mining, Market Segmentation, Retail industry, Telecommunications industry, Banking & Finance and CRM. **(13)**

TOTAL : 45

TEXT BOOKS

1. *Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition, Elsevier Publications, 2012.*
2. *Efraim Turban, Ramesh Sharda, DursunDelen and Janine E. Aronson, "Business Intelligence - A Managerial Approach", 2nd Edition, Pearson Prentice Hall, 2010.*

REFERENCE BOOKS

1. *Arun K Pujari, "Data Mining Techniques", Universities Press.*
2. *Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009.*

15MSSE32 - BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE31, 15MSSE33

ASSESSMENT : THEORY

COURSE OUTCOME

- *Relate the concepts of big data, analytics and their financial value in various business domain*
- *Apply the tools, frameworks and techniques of data streams, predictive analytics and visualization for the given problem*
- *Apply data analysis techniques in given use cases from various business domains.*
- *Construct efficient solutions using mining algorithm guidelines from large volumes of given data.*
- *Create different models using analytics frameworks and tools to gain faster insights.*

INTRODUCTION TO BIG DATA

Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety, Value - Issues - Case for Big data - Big data options. Team challenge - Big data sources - Acquisition - Nuts and Bolts of Big data. Features of Big data - security, compliance, auditing and protection - Evolution of Big data - Best practices for Big data analytics. **(10)**

DATA ANALYSIS

Evolution of analytic scalability - Convergence - Parallel processing systems - Cloud computing -Grid computing - Enterprise analytic sand box - Analytic data sets - Analytic methods -analytic tools - Cognos - Microstrategy - Pentaho. Analysis approaches - Statistical significance -Business approaches - Analytic innovation - Traditional approaches - Iterative approaches. **(9)**

STREAM COMPUTING

Introduction to Streams Concepts - Stream data model and architecture - Stream computing - Sampling data in a stream - Filtering streams - Counting distinct elements in a stream - Estimating moments - Counting oneness in a window - Decaying window. Case studies: Real time sentiment analysis, Stock market predictions. **(9)**

PREDICTIVE ANALYTICS

Predictive analytics - Supervised - Unsupervised learning - Mining Frequent itemsets - Market based model - Apriori algorithm - Handling large data sets in Main memory - Limited pass algorithm - Counting frequent itemsets in a stream - Clustering techniques - Hierarchical - K- Means - Clustering high dimensional data. **(9)**

FRAMEWORKS AND VISUALIZATION

MapReduce - Hadoop, Hive, MapR - Sharding - NoSQL Databases - S3 - Hadoop Distributed File Systems - Visualizations - Visual data analysis techniques - Interaction techniques **(8)**

TOTAL : 45

TEXT BOOKS

1. *Frank J Ohlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.*
2. *Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.*
3. *Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.*

REFERENCE BOOKS

1. *Jiawei Han, MichelineKamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition,Elsevier Publications, 2012.*
2. *Michael Minelli, Michelle Chambers and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.*
3. *P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.*
4. *Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.*
5. *E. Capriolo, D. Wampler and J. Rutherglen, "Programming Hive", O'Reilley, 2012.*

15MSSE33 - BUSINESS INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE31

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply Engineering approach to make better business decisions by analyzing risk factors*
- *Devise efficient managerial decisions based on mathematical models for real time business intelligence applications*
- *Develop strategic project planning by analyzing customer requirements in various dimensions with cost and time efficiency.*
- *Differentiate various prototyping models and their applicability for data modeling based on real time requirements and infrastructure.*
- *Specify ETL operations for real time business intelligence projects using tools and analyze the feasibility in terms of strengths and weaknesses.*

BASICS OF BUSINESS INTELLIGENCE

Decision Support Systems : Definition - Representation of the decision making process - Evolution of information systems - Development of DSS. Mathematical models for decision making: Structure - Development of a model - Classes of models. **(10)**

BUSINESS INTELLIGENCE STAGES AND STEPS

BI definition - BI decision support initiatives - Development approaches - Engineering stages and the development steps - Parallel development tracks - BI project team structure.

Business Case Assessment : Justification - Drivers - Business Analysis issues - Risk assessment - Activities - Deliverables - Roles **(9)**

BI PROJECT PLANNING AND REQUIREMENTS DEFINITION

BI project: managing - Defining - Planning - Activities - Deliverables - Roles. Project Requirements Definition: General and specific requirements - Activities - Deliverables - Roles **(8)**

DATA ANALYSIS AND APPLICATION PROTOTYPING

Data Analysis: Business focused data analysis - Top-down logical data modeling - Bottom-up source data analysis - Data cleansing - Activities - Deliverables-Roles.

Prototyping: Purpose - Best practices - Types - Building successful prototypes - Application prototyping Activities - Deliverables - Roles. **(9)**

DATABASE DESIGN AND ETL DESIGN

Differences in database design - Logical and physical database design - Activities - Deliverables - Roles. ETL Design: Implementation strategies - Preparing for ETL process - Designing the extract programs, Transformation programs, Load programs, ETL process flow - Evaluating ETL tools - Activities - Deliverables - Roles. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009. (Unit 1)*
2. *Larissa T.Moss and Shaku Atre, "Business Intelligence Roadmap: The Complete project life cycle for decision support applications", Addison Wesley, 2003. (Units II, III, IV & V).*

REFERENCE BOOK

1. *Efraim Turban, Ramesh Sharda, DursunDelen and Janine E. Aronson, "Business Intelligence - A Managerial Approach", 2nd Edition, Pearson Prentice Hall, 2010.*

15MSSE34 - MACHINE LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe and design the concepts of learning, and the perspectives and issues in machine learning.*
- *Apply the machine learning techniques - Clustering, Induction, Bayesian, Decision Tree, Analytical, Instance based learning and to apply the techniques in computing.*
- *Compare the various machine learning techniques and design issues in machine learning.*
- *Perform evaluation of learning algorithms, model selection, and how to apply a variety of learning algorithms to data.*
- *Development of new machine learning algorithms that learn more accurately, utilize data from dramatically more diverse data sources available over the Internet.*

INTRODUCTION

Designing a learning system - Perspectives and Issues in machine learning - Concept learning task - Concept learning as search - Version spaces - Candidate Elimination learning algorithm - Inductive Bias. **(9)**

DECISION TREE LEARNING

Decision Tree representation - Appropriate Problems for Decision Tree Learning - Basic Decision tree learning algorithm - Hypothesis space search and Inductive Bias in Decision tree learning - Issues in Decision Tree Learning. **(7)**

ANN

Perceptrons - Back propagation Algorithms. Evaluating Hypothesis: Deriving confidence intervals - Hypothesis testing - comparing learning algorithms. **(5)**

BAYESIAN LEARNING

Bayes Theorem and Concept learning - Maximum Likelihood and Least Squared error hypothesis - Maximum Likelihood hypotheses for predicting probabilities - Minimum description Length principle - Bayes optimal classifier - Gibbs algorithm - Naïve Bayes classifier - Bayesian Belief networks -EM algorithm. **(9)**

ANALYTICAL AND COMBINING ANALYTICAL & INDUCTIVE LEARNING

Analytical learning - Explanation based learning - Inductive Analytical approaches to learning - Using prior knowledge to, initialize the hypothesis, alter the search objective and augment search operators. **(6)**

INSTANCE-BASED AND REINFORCEMENT LEARNING

K - nearest neighbour learning -Locally weighted regression - Radial Basis functions - Case based reasoning - Reinforcement learning: Learning task-Q Learning-Q function - Algorithm for learning Q-convergence - updating sequence - Temporal difference learning - Non deterministic rewards and actions. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2003.*
2. *EthemAlpaydin, "Introduction to Machine Learning", MIT Press, 2nd Edition, 2010.*
3. *Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition, 2009.*
4. *Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.*
5. *Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990.*

15MSSL01 - SOFTWARE LANGUAGE ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Practice with tools such as LEX for identifying tokens.*
- *Integrate tools such as YACC for parsing.*
- *Experiment the techniques involved in translating high level languages to abstract machine instructions.*

CONCEPTS TO BE COVERED

PROGRAMMING EXERCISES WILL INCLUDE

1. Use of tools for lexical analysis and parsing
2. Representation of abstract syntax
3. Abstract machines for imperative and functional languages
4. Translations from high-level languages to abstract machine instructions
5. Implementation of run-time structures and parameter-passing
6. Type checking and type-inference
7. Term reduction

15MSSL02 - ENTERPRISE APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSPE3

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop the client application using HTML or Java Server Page*
- *Construct web components to process the client request and generate response in online using Java Servlet*
- *Design and Develop reusable business logic using Session EJB framework*
- *Generate persistent entities using Entity EJB frameworks*
- *Construct web feed to improve the user accessibility of the web application using web 2.0 framework*

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

1. Understand and design the generic business process model of an enterprise.
2. Design and implement online business processing through Servlet components.
3. Develop reusable business logics using Session EJB components.
4. Develop persistent entity objects using Entity EJB components.
5. Improve the business through developing enterprise blogs.
6. Improve the user accessibility of the application by creating web feeds.

15MSSL03 - GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSPE9

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Examine the efficiency for drawing graphics primitives such as line, circle, ellipse and polygon using DDA, Midpoint and Bresenham's algorithms.*
- *Demonstrate 2D transformations such as translation, scaling, rotation, reflection and shearing for a given application.*
- *Develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications surrounding the emergence of multimedia technology.*

I Computer Graphics

1. Primitive Algorithms

   Line - Bresenham, DDA, Midpoint. Circle - Midpoint, Trigonometric Ellipse - Midpoint, Trigonometric
2. Polygon, Polygon Filling.
3. Transformations - 2D Translations, Scaling, Rotation

II Multimedia and Animations:

Flash Programming (OR) Maya

1. Creating Layers, Symbol objects, effects for objects
2. Creating scene by combining objects and layers
3. Creating Animations using various technologies
4. Creating Interactive Animation.
5. Adding audio to animations.
6. Creating small animation projects.

15MSSL04 - ACCOUNTING SOFTWARE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor.

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Employ suitable tool for generating complete accounting statements*
- *Identify the technologies needed to implement accounting practices as a developer.*
- *Create Statements of Financial accounting for a profit organization to ascertain profits.*
- *Develop simple models of decision making techniques like capital budgeting and ratio analysis.*
- *Interpret the results of problems in decision making techniques.*

CONCEPTS TO BE COVERED

1. Creating company profiles and configuring the system for the present assessment year.
2. Creating all basic account groups and accounts relevant to the companies created.
3. Handling transaction processing systems.
4. Design reports as per the conventional formats for each statement.
5. Creating Analysis models for budget, ratio and Capital budgeting.
6. Creating decision support reports on various transaction data and analysis data.
7. Provide statistical analysis for required DSS

15MSSL05 - WEB SERVICES LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Demonstrate the use of web service in real time web application development*
- *Design and develop appropriate web services according to the requirements of given web application*
- *Ability to select the right web service component to be used in applications wherever required to reduce development time of the web application*
- *Develop new web service based on the user requirements and consume them in web and mobile applications.*

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

- Modeling the business services.
- Implement the Service Interface and Service Implementation Classes with Java-ws.
- Write WSDL document to describe services.
- Publish web service in Jav-ws platform.
- Create Java Web Service Client with Java-ws.
- Create and send messages using SOAP Attachment API for Java (SAAJ).
- Accessing the message content and Adding elements to the message using SAAJ.

15MSSL06 - CLOUD COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS33

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Demonstrate knowledge on creating, cloning, migrating virtual machines using VirtualBox, a virtualization tool*
- *For a given system configuration, can use EC2 to acquire instances*
- *Develop an application, launch it on Google App Engine, and access it with proper authentication mechanisms*
- *Construct a private cloud using the open source cloud technologies such as OpenStack/CloudStack/ OpenNebula for a given requirement*
- *For a given requirement, develop application using the simulation tool, CloudSim*

I. VIRTUALIZATION - VIRTUAL BOX

1. Create virtual machines of different configurations
2. Communication between host and virtual machine
3. Communication between virtual machine to virtual machine
4. Show the virtual machine migration from one node to the other.

II. PRIVATE CLOUD

Use Eucalyptus or OpenStack or CloudStack or equivalent to set up the cloud and demonstrate:

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration from one node to the other.
5. Find procedure to install storage controller and interact with it.

III. PUBLIC CLOUD

1. Explore Amazon S3 and EC2
2. Create virtual machines in Amazon, run a sample java application on the EC2 instance
3. Communicate between two EC2 instances
4. Run an application in the GoogleAppEngine

IV. SIMULATION TOOL - CLOUDSIM

15MSSL07 - PARALLEL COMPUTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Given a parallel algorithm, develop the system using MPI.*
- *Given a parallel code, analyze its performance, determine computational bottlenecks, and optimize the performance of the code.*
- *Given a parallel code, diagnose the errors and fix them*
- *Given a problem, implement an efficient and correct code to solve it, analyze its performance*
- *Given a network of stations, construct a cluster using Local Area Multicomputer*

Set Up : Building a cluster using Local Area Multicomputer (LAM)

PARALLEL APPLICATIONS EXPLOITING THE FOLLOWING FEATURES OF MPI NEED TO BE GIVEN

1. Inter-process communication in MPI
2. Communication between MPI Processes: Blocking Operation
3. MPI collective operations using synchronization, data movement, collective computation
4. Communication between MPI Processes: Non-Blocking Operation
5. Collective Communication in MPI: Broadcast and Reduce
6. Collective Communication in MPI: Scatter and Gather

15MSSL08 - IMAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Develop the basic Knowledge of any Image processing toolbox (Matlab/Scilab) available and perform different basic image operations.*
- *Perform various filtering operations in the image processing toolbox.*
- *Implement different types of edge detection technique on same image and measure the accuracy.*
- *Apply various image transforms and analyse the characteristics of the image.*
- *Apply image processing technique to solve real world problems*

LIST OF EXPERIMENTS

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Filtering in frequency domain.
4. Display of color images.
5. Conversion between color spaces.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. 2-D DFT and DCT.
9. DWT of images.
10. Segmentation using watershed transform.

15MSSL09 - REAL-TIME EMBEDDED SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS16

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To develop programs based on PIC Microcontroller arithmetical and logical instructions*
- *To develop embedded C programs for PIC Microcontroller ROM and RAM using MPLAB*
- *To construct ALP and c programs using PIC microcontroller timer, counter and serial port*
- *To write programs based on timer, external hardware and serial communication interrupts using MPLAB*
- *To write and develop programs for MUCOS RTOS system level, memory level and time delay functions*

CONCEPTS TO BE COVERED

The students must be trained for

1. Using the constructs of MPLAB
2. Writing programs using PIC microcontroller architecture.
3. Using the constructs of µCoS RTOS

15MSSL10 - BUSINESS INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSSE31, 15MSSL11

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Demonstrate generation of business reports and presentations using BI Tools for the given case studies.*
- *Evaluate data by extracting and Transforming using ETL tools for any given dataset.*
- *Effectively apply data mining techniques in variety of business applications to generate mining solutions.*
- *Design and implement practical business intelligence solution for real time projects.*
- *Outline the role of business analytics within an organization.*

TOPICS TO BE COVERED

1. Construct data warehouse/database and perform Extraction of data using queries, Loading data and apply Transformational techniques using ETL tools.
2. Generating reports using Business Intelligence tools.

15MSSL11 - DATA MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

15MSS44

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Employ data cleaning techniques for normalization and standardization of given dataset.*
- *Determine the mining solutions using data mining techniques in real time problems.*
- *Calculate Information Gain measure to select the test attribute in the decision tree.*
- *Find the outliers using various Outlier Detection methods in a given dataset.*
- *Evaluate the accuracy of measures for text retrieval and classification of Web documents.*

PROBLEMS

1. Perform data cleaning techniques for a given data test.
2. Perform Data Normalization using min-max, z-score and normalization by decimal scaling methods.
3. Extract Frequent Item Sets using candidate generation and without using candidate generation.
4. Calculate Information Gain measure to select the test attribute in the decision tree.
5. Perform Decision Tree Induction for a given training data.
6. Develop a model to apply Linear Regression for prediction.
7. Implementing clustering techniques (k-means, k-medoids)
8. Find the outliers using various Outlier Detection method.
9. Evaluation of measures for text retrieval.
10. Classification of Web documents.

Tool : RapidMiner / Wega

15MSSL12 - BIG DATA ANALYTICS LABORATORY

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Operate the tools in hadoop echo system for data analytics reports in real time applications.*
- *Use the R tool for solving big data analytic problems that help to manage good decision making.*
- *Experiment the analytical techniques on variety of Big data application scenarios.*
- *Generate dynamic solutions for data analytics problems using map reduce framework*
- *Set up hadoop clusters and write complex map reduce programs for parallel processing of big data.*

PROBLEMS

€ Using R for implementing the data mining algorithms and techniques.

€ Using R for analyzing the data in various business domains

€ Solving problems in Data Analysis using Hadoop echo system and MapReduce framework