COIMBATORE INSTITUTE OF TECHNOLOGY
(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)
DEPARTMENT OF COMPUTING
M.Sc. (Software Systems)
Curriculum - For the Students admitted during 2020 - 2021 and onwards

Semester I

Course Code	Course Name	L	T	P	C	CAT
Theory						
20MSS11	Technical English	2	0	1	2	HS
20MSS12	Applied Algebra and Calculus	3	1	0	4	BS
20MSS13	Structured Systems Analysis and Design	3	0	0	3	PC
20MSS14	Digital Electronics	3	0	0	3	PC
20MSS15	Problem Solving using C Programming	3	1	0	4	PC
Practicals						
20MSS16	Computing Lab	0	0	4	2	PC
20MSS17	Programming Lab in C	0	0	4	2	PC
20MSS18	Digital Electronics Lab	0	0	2	1	PC
20MSS19	Employability Skills	0	0	2	1	EEC
	Total Credits				**22**	

Semester II

Course Code	Course Name	L	T	P	C	CAT
Theory						
	Language Elective	2	0	1	2	HS
20MSS21	Probability and Statistics - I	3	1	0	4	BS
20MSS22	Data Structures and Algorithms	3	1	0	4	PC
20MSS23	Fundamentals of Web Technology	3	0	0	3	PC
20MSS24	Object Oriented Programming	3	0	0	3	PC
Practicals						
20MSS25	Web Application Development Laboratory	0	0	4	2	PC
20MSS26	Data Structures and Algorithms Laboratory	0	0	4	2	PC
20MSS27	Object Oriented Programming Laboratory	0	0	4	2	PC
20MSS28	English for Employability	0	0	2	1	EEC
	Total Credits				**23**	

Semester III

Course Code	Course Name	L	T	P	C	CAT
Theory						

Course Code	Course Name	L	T	P	C	CAT
20MSS31	Theoretical Computer Science	3	0	0	3	BS
20MSS32	Probability and Statistics – II	3	1	0	4	BS
20MSS33	Advanced Data Structures	3	0	0	3	PC
20MSS34	Computer Architecture	3	0	0	3	PC
20MSS35	Operating Systems	3	0	0	3	PC
Practicals						
20MSS36	Python Programming Lab	0	0	4	2	PC
20MSS37	Advanced Data Structures Lab	0	0	4	2	PC
20MSS38	Operating Systems Lab	0	0	4	2	PC
	Total Credits				**22**	

Semester IV

Course Code	Course Name	L	T	P	C	CAT
Theory						
20MSS41	Resource Management Techniques	3	0	0	3	BS
20MSS42	Microprocessors and Microcontrollers	3	0	0	3	PC
20MSS43	Software Engineering	3	0	0	3	PC
20MSS44	Database Management Systems	3	0	0	3	PC
20MSS45	Java Programming	3	0	0	3	PC
Practicals						
20MSS46	Microprocessors and Microcontrollers Lab	0	0	4	2	PC
20MSS47	Database Management Systems Lab	0	0	4	2	PC
20MSS48	Java Programming Lab	0	0	4	2	PC
20MSS49	Personality Development	0	0	2	1	EEC
	Total Credits				**22**	

Semester V

Course Code	Course Name	L	T	P	C	CAT
Theory						
20MSS51	Full Stack Application Development	3	0	0	3	PC
20MSS52	Computer Networks	3	0	0	3	PC
20MSS53	Design and Analysis of Algorithms	3	1	0	4	PC
20MSS54	Machine Learning	3	0	0	3	PC
	Elective I	3	0	0	3	PC
Practicals						
20MSS55	Full Stack Application Development Lab	0	0	4	2	PC
20MSS56	Network Programming Lab	0	0	4	2	PC
	Elective Lab I	0	0	4	2	PC
20MSS57	Communications Skills	0	0	2	1	EEC
	Total Credits				**23**	

Semester VI

Course Code	Course Name	L	T	P	C	CAT
Theory						
20MSS61	Software Testing and Quality Assurance	3	0	0	3	PC
20MSS62	Mobile Computing	3	0	0	3	PC
20MSS63	Cloud Computing	3	0	0	3	PC
20MSS64	Software Architecture	3	0	0	3	PC
	Elective II	3	0	0	3	PC
Practicals						
20MSS65	Software Engineering Lab	0	0	4	2	PC
20MSS66	Cloud and Mobile Application Development Lab	0	0	4	2	PC
	Elective Lab II	0	0	4	2	PC
20MSS67	Hackathon	0	0	2	1	EEC
	Total Credits				**22**	

Semester VII

Course Code	Name	L	T	P	C	CAT
20MSS71	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						
20MSS81	Software Project Management	3	0	0	3	PC
20MSS82	Smart Sensors and Internet of Things	3	0	0	3	PC
20MSS83	Artificial Intelligence	3	0	0	3	PC
	Elective III	3	0	0	3	PC
	Elective IV	3	0	0	3	PC
Practicals						
20MSS84	Internet of Things Lab	0	0	4	2	PC
20MSS85	Artificial Intelligence Lab	0	0	4	2	PC
	Elective Lab III	0	0	4	2	PC
	Total Credits				**21**	

Semester IX

Course Code	Course Name	L	T	P	C	CAT
Theory						
20MSS91	Agile Methods for Software Development	3	0	0	3	PC
20MSS92	Information Security	3	0	0	3	PC
20MSS93	Professional Ethics	3	0	0	3	EEC
	Elective V	3	0	0	3	PC
	Elective VI	3	0	0	3	PC
Practicals						
20MSS94	Information Security Lab	0	0	4	2	PC
	Elective Lab IV	0	0	4	2	PC
	Elective Lab V	0	0	4	2	PC
	Total Credits				**21**	

Semester X

Course Code	Name	L	T	P	C	CAT
20MSS101	Project Work and Viva Voce-II	0	0	0	18	EEC
	TOTAL CREDITS				**18**	
	GRAND TOTAL OF CREDITS				**212**	

Elective Theory Courses

Subject code	Subject Name	L	T	P	C	CAT
Distributed and Networked Systems Stream						
20MSSE01	SOA and Web Services	3	0	0	3	PE
20MSSE02	Distributed Computing	3	0	0	3	PE
20MSSE03	Parallel Computing	3	0	0	3	PE
20MSSE04	Blockchain Technologies	3	0	0	3	PE
Data Analytics Stream						
20MSSE05	Big Data Architecture	3	0	0	3	PE
20MSSE06	Information Retrieval	3	0	0	3	PE
20MSSE07	Advanced Database Management Systems	3	0	0	3	PE
20MSSE08	Predictive Analytics	3	0	0	3	PE
20MSSE09	Data Mining	3	0	0	3	PE
Intelligent Systems Stream						
20MSSE10	Computer Vision	3	0	0	3	PE
20MSSE11	Natural Language Processing	3	0	0	3	PE
20MSSE12	Meta-Heuristic Learning	3	0	0	3	PE
20MSSE13	Deep Learning	3	0	0	3	PE
20MSSE14	Decision Support Systems	3	0	0	3	PE
20MSSE15	Business Intelligence	3	0	0	3	PE
General Stream						
20MSSE16	Virtual and Augmented Reality	3	0	0	3	PE
20MSSE17	Compiler Design	3	0	0	3	PE
20MSSE18	Software User Interface Design	3	0	0	3	PE
20MSSE19	Enterprise Application Development	3	0	0	3	PE
20MSSE20	Design Thinking	3	0	0	3	PE
20MSSE21	Business Process Management	3	0	0	3	PE
20MSSE22	Software Language Engineering	3	0	0	3	PE
20MSSE23	Accounting and Financial Management	3	0	0	3	PE
20MSSE24	Human Computer Interaction and Interface	3	0	0	3	PE
20MSSE25	Quantum Computing	3	0	0	3	PE
20MSSE26	Real Time Systems	3	0	0	3	PE

Elective Labs

Subject code	Subject Name	L	T	P	C	CAT
	Distributed and Networked System Stream					
20MSSL01	S0A and Web Services Lab	0	0	4	2	PE
20MSSL02	Parallel Computing Lab	0	0	4	2	PE
20MSSL03	Blockchain Technologies Lab	0	0	4	2	PE
	Data Analytics Stream					
20MSSL04	Data Mining Lab	0	0	4	2	PE
20MSSL05	Big Data Architecture Lab	0	0	4	2	PE
20MSSL06	Predictive Analytics Lab	0	0	4	2	PE
	Intelligent Systems Stream					
20MSSL07	Natural Language Processing Lab	0	0	4	2	PE
20MSSL08	Meta-Heuristic Learning Lab	0	0	4	2	PE
20MSSL09	Deep Learning Lab	0	0	4	2	PE
20MSSL10	Business Intelligence Lab	0	0	4	2	PE
20MSSL11	Computer Vision Lab	0	0	4	2	PE
20MSSL12	Machine Learning Lab	0	0	4	2	PE
	General Stream					
20MSSL13	Virtual and Augmented Reality Lab	0	0	4	2	PE
20MSSL14	Compiler Construction Lab	0	0	4	2	PE
20MSSL15	Enterprise Application Development Lab	0	0	4	2	PE
20MSSL16	Accounting and Financial Management Lab	0	0	4	2	PE
20MSSL17	Quantum Computing Lab	0	0	4	2	PE

20MSS11-TECHNICAL ENGLISH

	Contact Hours		
L	T	P	C
2	0	1	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

- *Given a social context, compose appropriate dialogues using functional words, Construct Descriptive Paragraphs and review using sequencing words and unity of thought*
- *Given a communication context, categorize the barriers to communication and formulate solutions.For a given communication situation, like introducing oneself, asking questions, disagreeing, expressing preferences, asking for and giving directions, generate functional expressions and construct dialogues.*
- *Given short conversations and monologues for listening, specify appropriate responsesand construct a summary.*
- *Interpret the given technical graphical representation and compose passages. Summarize and paraphrase technical text sin about 250 to 300 words.*
- *Apply the rules of the grammar viz, word formation, verbs, tenses, question tags, prepositions, articles, conjunctions, concord, Idiomatic expressions, one word substitutes, Homophones and homonyms, linking words, adjectives and Degrees of Comparison, use appropriate patterns in the given sentence.*

FOCUS ON LANGUAGE: GRAMMAR & VOCABULARY

Tenses – Question Tags – Prepositions – Articles – Conjunctions – Subject Verb Agreement – Idiomatic Expressions - Word Formation: Prefixes & Suffixes - One Word Substitutes – Homophones and Homonyms – Contracted form of Verbs – Emphasis - Linking Words – Common Errors and Redundancies – Adjectives - Degrees of Comparison

(5)

TECHNICAL COMMUNICATION

Importance of Technical Communication - Objective & Characteristics of Technical Communication – General and Technical Communication – Process of Communication - Levels of Communication – Flow of Communication –Visual Aids in Technical Communication - Barriers to Communication: Noise – Classification of Barriers –Non-verbal Communication: Kinesics – Proxemics - Chronemics - Social Media Etiquette

(5)

READING

Reading Comprehension – Skimming and Scanning – Summarizing – Sequencing of Sentences - Intensive & Extensive Reading- Note Making – SQ3R Reading Technique.   (4)

WRITING

Gadget Review – Types of Paragraphs – Description – Describing Structures – Information Transfer - Describing Trends – Paragraph Construction - Paragraph Patterns – Kinds of Paragraph – Writing a First Draft, Revising & Finalizing - Steps to Effective Précis Writing - Dialogue Writing – Essay Writing.   (6)

LISTENING

Meaning and Art of Listening-Importance of Listening & Empathy in Communication – Reasons for Poor Listening – Traits of a good listener – Listening modes - Listening and Filling Information – Identifying parts from a discussion.

(4)

SPEAKING

Introducing Oneself- Asking Questions –Retelling an Incident – Small Talk – Disagreeing – Expressing Preferences – Asking for and Giving Directions -Achieving Confidence, Clarity & Fluency – Vocal Cues - Barriers to Speaking – Types of Speaking – Persuasive Speaking – Public Speaking - Effective Presentation Strategies – Planning - Outlining & Structuring – Nuances of Delivery – Controlling Nervousness & Stage Fright – Making an Oral Presentation -Visual Aids in Presentation – Applications of MS Power Point.

(6)

Practical Sessions based on Theory   **(15)**

TOTAL : 45 Hours

TEXT BOOKS
1. Sudharshana N. P &Savitha C, "English for Technical Communication", CUP, 2016.
2. Meenakshi Raman, Sangeeta Sharma, "Technical Communication – Principles and Practice", Oxford University Press, New Delhi, 2015.

EXTENSIVE READING
1. C.M.Sharma, "Twelve Short Stories" OUP, 2000. (Only Essay Questions)

REFERENCE BOOKS
1. Jack C Richerds, "Interchange - 2", CUP, Fourth Edition, Chennai, 2015.
2. Sudharshana N. P & Savitha C, "English for Engineers", CUP, 2018.
3. Ronald Carter, Michael McCarthy. "Cambridge Grammar of English" Cambridge University Press, 2011.
4. Michael McCarthy and Felicity O'Dell, "English Vocabulary in Use", Cambridge University Press, 2012.
5. Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.

20MSS12- APPLIED ALGEBRA AND CALCULUS

Contact Hours

L	T	P	C
3	1	0	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

- *Achieve good skill in applying iterative methods for solving equations and developing algorithms.*

- *Gain in depth knowledge in matrices and their properties that can be used for effective understanding of subjects in computer technology and algorithms.*

- *Get good understanding of tools of differential and integral calculus to solve real world problems and optimisation.*

- *Develop skills in applying mathematical tools for empirical modelling and data analysis.*

- *Achieve knowledge in numerical methods for solving ordinary differential equations.*

SOLUTION OF EQUATIONS: Algebraic and transcendental equations: Bisection method, Regula-Falsi method, method of iteration and Newton Raphson method-Convergence of Newton-Raphson Method.   **(8)**

VECTOR SPACES and MATRICES: Linear dependence and independence of vectors–dimension, basis – rank of a matrix – linear transformation. The Inverse of a Matrix–Properties and Algorithm to find the Inverse of a Matrix: Gauss Jordan Method- Solving a system of Linear Equations Using Matrix Inverse. Gauss Seidal iteration method. Eigen values and Eigen vectors - 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 Linear Systems: Homogeneous system in Economics, Balancing chemical equations, Network flow, Linear Equations in Electrical Networks. Applications of Matrices: The Leontief Input Output Model in Economics, Homogeneous Coordinates and their applications to Computer Graphics.

(13)

CALCULUS: Differential Calculus:-Maxima and Minima of function of single variables–Functions of Several Variables-Partial Derivatives- Homogeneous functions and Euler's Theorem-Jacobians-Taylor's Series for a function of two variables-Maxima and minima of functions of two variables-Constrained Optimization using Lagrange Multipliers**-**Applications to optimization problems-**Integral Calculus:** Differentiation under integral sign-Applications-Beta and Gamma Functions- Double and triple integrals – Applications: Area, volume, surface area etc.-Changing the order of integration in double integrals.

(12)

EXPERIMENTAL DATA ANALYSIS: Curve fitting: Least Square Method. **Interpolation:** Newton's method - Lagrange's method. **Numerical Differentiation:** Newton's forward and backward formulae to compute the derivatives-Application to maxima and minima of a tabulated function. **Numerical Integration:** Trapezoidal rule- Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule-Double integration- Applications to real world problems. **(8)**

NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS: Taylor's Series – RungeKutta Fourth order methods – Milne's Predictor – Corrector Method.

(4)
TOTAL: 45 Hours
TUTORIAL: 15 Hours
TOTAL:60 Hours

TEXT BOOKS

1. Kandasamy, P.et al., "Engineering Mathematics", Volume – I & II (8th Fully Revised Edition), "S. Chand & Co, 2008.
2. SankaraRao, K., "Numerical Methods for Scientists and Engineers" Third Edition, Prentice Hall of India Pvt. Ltd., New Delhi (2006)

REFERENCE BOOKS

1. Veerarajan T, "Engineering Mathematics (For First Year)", (first revised edition), Tata McGraw Hill Publishing company Ltd., 2008.
2. Venkataraman. M.K., "Engineering Mathematics", (First year), The National Publishing Company, 2008.
3. David C Lay "Linear Algebra and its Applications", Fourth edition Pearson 2012.
4. R.A.Barnett, M.R.Ziegler and K.E.Bylen, Calculus for Business, Economics, Life Sciences and Social Sciences, 12th Edition, Prentice Hall, 2011.
5. L.D.Hoffman and G.L.Bradley, Calculus for Business, Economics and the Social and Life Sciences, 10th Edition, McGraw Hill, Higher Education, 2010.

20MSS13-Structured Systems Analysis and Design

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent to the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and articulate the role of system analyst in modern organizations and how the analyst functions in each phase of the system development life cycle.*

- *Identify the right requirements gathering tool to represent the information in quantitative manner.*

- *Choose the appropriate design methods for inputs and outputs for effective user interaction with the information systems.*

- *Solve a wide range of problems related to analysis, design and construction of information systems.*

- *Apply suitable procedures to ensure the correctness of data so as to build and operate quality information systems.*

SYSTEMS ANALYSIS FUNDAMENTALS

Need for systems Analysis and Design – Roles of a System Analyst(consultant, supporting expert, agent of change, system Analyst) - The Systems Development Life Cycle - Developing Open Source Software – Organizations as Systems – Project initiation, feasibility, managing Time and Activities, Project Scheduling using Gantt charts and PERT diagram.

(9)

INFORMATION REQUIREMENTS ANALYSIS

Information gathering using interactive methods: Interviewing, using questionnaires. Information gathering using unobtrusive methods: sampling, investigation analysing quantitative documents – case study and group project for interactive method and unobtrusive methods.

(9)

THE ANAYSIS PROCESS

Using Data Flow Diagrams – analysing systems using data dictionaries –process specification format – structured English – decision tables – decision trees. Diagramming using Microsoft Visio.

(9)

THE ESSENTIALS OF DESIGN

Designing effective output: output design objectives – relating output content to output method – designing output for displays – designing a website – Designing Apps for smartphones and tablets.

Designing effective input: Good forms design – good display and web forms design – website design. Databases (only fundamental)- data concepts : data and metadata, files, relational database- steps in retrieving and presenting data.

(9)

HUMAN-COMPUTER INTERACTION AND DESIGNING ACCURATE DATA ENTRY PROCEDURE

Understanding Human – Computer Interaction – usability – Types of User Interfaces – Designing Interfaces for smartphone and Tablets – Designing accurate data entry procedures : Effective coding – effective and efficient data capture – ensuring data quality through input validation.

(9)

TOTAL :45 Hours

TEXT BOOK

1. Systems Analysis and Design, Kendall & Kendall, Eastern Economy Edition, PHI, Ninth edition, 2014.

REFERENCE BOOKS

1. Joseph. S.Valacich, Joey. F. George, Jeffrey A. Hoffes , "Essentials of Systems Analysis and Design", Eastern Economy Edition, PHI, fourth edition, 2009.

2. Whitten and Bentley, "System Analysis and Design Methods", Tata McGraw Hill, seventh edition, 2015.

3. Alan Dennis, Barabara Haley wixom, Roberta M.Roth, "System Analysis and Design", Wiley student edition, fourth edition, 2014.

20MSS14 - DIGITAL ELECTRONICS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Ability to understand the elements of digital system abstractions such as digital representations of information, digital logic, and Boolean algebra*

- *Identify basic requirements for a design application*

- *Evaluate combinational and sequential logic designs using various metrics: switching speed, throughput/latency, and gate count*

- *Create gate level implementations of sequential/ combinational logic function.*

- *Design and develop digital logic for real time applications.*

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, CRC and Hamming code.

BINARY ADDITION AND SUBTRACTION
Unsigned and signed numbers - 1's, 2's, 9's, 10's, 15's, 16's Complement representation - 1's and 2's Complement Binary subtraction - BCD addition - 9's and 10's BCD subtraction - Binary Multiplication and Division   (9)

BOOLEAN ALGEBRA AND LOGIC GATES
Introduction - Basic theorem and postulates - Boolean function - Canonical and Standard forms - Minimization of Boolean expression - Karnaugh Map and Quine Mc-Cluskey Method - Basic logic gates - truth tables - Applications.   (9)

COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUITS
Combinational logic: Half Adder and Full Adder, Half Subtractor and Full Subtractor -Encoder and Decoder – 4X1 Multiplexer and 1X4 Demultiplexer.

Sequential logic: Latches and Flip Flops - Clocked RS, JK, T and D Flip-Flops –Timing Parameters - Applications

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(10)

COUNTERS AND REGISTERS

Introduction to Asynchronous and Synchronous Counters: 4 bit Up counter and 4 bit Down counter - Mod n counters - Parallel / Serial In / Out Shift Registers - Ring Counter.

(9)
TOTAL :45 Hours

TEXT BOOK

1. Anil K. Maini, "Digital Electronics Principles, Devices and Applications", John Wiley & Sons Ltd, 2007.

2. A.P.Godse,"Digital Electronics", Technical Publications, Pune, 2009.

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.

20MSS15 - PROBLEM SOLVING USING C PROGRAMMING

Contact Hours

L	T	P	C
3	1	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

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

INTRODUCTION

Introduction to Problem Solving - Fundamental Algorithms - Flowcharts/Pseudo codes – Introduction to Programming- Programming design methodologies. Introduction to C programming - Compilation Process - Syntax and Semantic errors –Keywords- Data Types- Variables and Constants- Operators- Arithmetic expressions, Relational Operations, Logical expressions–Mixed mode expressions- Precedence and Associativity of Operators- Type Conversion- Conditional Branching and Iterative Loops- Go to, Break, and Continue statement- Preprocessor directives.

(12)

ARRANGING THINGS - ARRAYS, STRINGS

Defining and Processing an Array – Passing Arrays to Functions – Multidimensional Arrays.
STRINGS: Defining a String – Reading and Writing – Processing – Character Arithmetic – Searching and Sorting.

(9)

FUNCTIONS AND STORAGE CLASSES

Defining and Accessing a Function –Passing Arguments – Command line arguments - Recursion.
Storage classes and Visibility - Automatic, External and Static Variables – Multi file Programs.

(8)

POINTERS AND STRUCTURES

Pointer Fundamentals – Operations on Pointers - Pointers and Arrays –Arrays of Pointers –Null Pointer- Pointers and Strings - Dynamic Memory Allocation. Defining and Processing Structures – Structures and Pointers – Passing Structures to Functions – Unions - Bitwise operators.

(9)

FILES

File handling using FILE pointers - Text File Handling – Binary File Handling – Sequential Vs. Random Access in files– Positioning file pointer.

(7)

TOTAL : 45 Hours

TEXT BOOKS

1. R.G.Dromey, "How to Solve it by Computer", 2nd Edition, Pearson Education, 2007.
2. Byron Gottfried, Schaum's outline series, "Programming with C", Tata McGraw Hill Publication, 2nd Edition, 2010.
3. Kernighan B.W. and Ritchie D.M., "The C Programming Language", 2nd Edition, Prentice Hall of India, 2006.

REFERENCE BOOKS

1. Herbert Schildt, "C- The Complete Reference", McGraw Hill, 4thedition, 2009.

2. Yashavant P. Kanetkar, "Let Us C", BPB Publications, 13th Edition, 2012.

3. Herbert Schildt, Jean Paul Tremblay, Richard B Bunt, "Introduction to Computer Science – An Algorithmic Approach", McGraw Hill, 2nd Edition, 1985.

4. Terrence W Pratt, "Programming language - Design and Implementation", Prentice Hall of India, 4th Edition, 2001.

20MSS16-COMPUTING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT:PRACTICAL

COURSE OUTCOME

- *Given a requirement, draft emails, letters, documents and reports, in printable format / desktop publishing, with suitable formatting and layout management, using MS Word.*
- *For a given topic, prepare presentation with appropriate text, audio, video, animation and data visualization, using MS PowerPoint.*
- *Given data and rules, perform statistical analysis, summarize data and generate visual representation of data and results, using MS Excel and Scilab.*
- *For a given keyword, search and retrieve relevant data from the internet, using a search engine and prepare documents / spreadsheets / presentations.*
- *Ability to use Linux commands, filters, and write efficient shell scripts.*

CONCEPTS TO BE COVERED

MS Word

- Creating, editing, saving and printing text documents
- Font and paragraph formatting, Simple character formatting
- Inserting tables, smart art, page breaks
- Using lists and styles
- Working with images
- Using Spelling and Grammar check
- Understanding document properties
- Mail Merge
- Creating and using Templates

MS Power Point

- Opening, viewing, creating, and printing slides
- Applying auto layouts
- Adding custom animation
- Using slide transitions
- Graphically representing data: Charts & Graphs
- Creating Professional Slide for Presentation.

MS Excel

- Spreadsheet basics: Creating, editing, saving and printing spreadsheets
- Working with functions & formulas: Logical, Statistical, Financial, Date & Time, Lookup & Reference
- Modifying worksheets with color & auto formats
- Graphically representing data: Charts & Graphs

- Speeding data entry : Using Data Forms
- Analyzing data : Data Menu, Subtotal, Filtering Data, Pivot Tables
- Formatting worksheets
- Securing & Protecting spreadsheets
- Dashboard Creation

Internet
- Understanding how to search/Google
- Bookmarking and Going to a specific website
- Copy and paste Internet content into documents / presentations / spreadsheets
- Using Google Forms, Google Docs, Google Sheet and Google Slides

Scilab
- Scilab Fundamentals
- Algebraic operations on matrices, Transpose of a matrix, Determinants, inverse of a matrix.
- Solving System of linear equations and consistency.
- Row reduced echelon form and normal form.
- Eigen values, Eigen vectors, Rank of a matrix.
- Solving algebraic and system of equations.

Linux
- Working with vi Editor in Linux.
- Learn the use of basic Linux commands.
- Learn the use of redirection and File access permissions.
- Working with filters.
- Working with commands such as find, cmp, comm, uniq.
- Writing efficient Shell Scripts.

20MSS17–PROGRAMMING LAB IN C

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OBJECTIVE

- *Solve 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.*

- *Design and Develop C programs to create and access the files for handling the persistent data*

CONCEPTS TO BE COVERED

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

20MSS18 - DIGITAL ELECTRONICS LAB

Contact Hours

L	T	P	C
0	0	2	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Emulate and understand the internal working of arithmetical, relational and logical circuits inside computer systems.*

- *Familiarize digital data processing and storage through combinational and sequential logic.*

- *Demonstrate serial and parallel data operations using shift registers and counters.*

- *Implement data encryption and decryption methods using encoding and decoding.*

- *Design low level to high level digital computer systems using combinational and sequential logic.*

CONCEPTS TO BE COVERED

- Study of logic gates.

- Study of Flip-Flops.

- Design of binary counter & decade counter.

- Construction of Half-adder & Full-adder.

- Implementation of basic Logic gates using Universal gates.

- Testing Left shift, Right shift and Parallel-In, Parallel-Out operation of the Shift registers.

- Multiplexing and Demultiplexing.

- Encoding and Decoding.

- Conversion of binary into gray and gray into binary.

20MSS19- EMPLOYABILITY SKILLS

Contact Hours

L	T	P	C
0	0	2	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME
- *Given strictly timed objective questions on logical reasoning and verbal ability solve within the given time.*
- *For a given specific speaking task on topics like describing a picture, movie reviews, storytelling, and extempore generate ideas and speak confidently.*
- *For a given social situation viz., greeting, thanking, congratulating, apologizing and giving directions, demonstrate command over conversations using appropriate functional expressions.*
- *For a given 2 to 5 minutes speaking activity like Extempore and Debate, produce language structures accurately and fluently. 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. Construct dialogues for a given social scenario and interpret the given graphic information and write creative paragraphs.*

UNIT – 1
Self Introduction - Barriers to Speaking and Listening - Introduction to Spoken English, Greetings, Thanking - Apologizing, Congratulating - Giving Directions, Shopping – Role Play   **(6)**
UNIT – 2
Activity based on newspaper articles - Word Building - A picture and a few words activity - Current Events.   **(4)**
UNIT -3
Alphabet test – Alphabet Order, Alphabet Series - Letter Word Problem, Word Formation and Scramble - Series Completion –Para Jumbles- Synonyms and Antonyms- Types and Exercises- Sentence Completion –Types and Exercises.   **(8)**
UNIT -4
Reading Comprehension- Skimming and Scanning - Reading Prose – Bacon's Essays (Speaking Activity based on the essays) - Story Building- Extempore - Movie Reviews.   **(4)**
UNIT – 5
Speech Sounds - Word Vocabulary - Reading Comprehension - Listening Practice- I -Dialogue Writing - Conversational Exercise – I - Focus on Language - Creative Writing - Conversational Exercise – II - Listening Practice – II   **(8)**

TOTAL: 30 Hours

Contact Hours

L	T	P	C
2	0	1	2

PRE-REQUISITES
 Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

- *Apply the rules of grammar namely Active and Passive voice, Direct and Indirect speech, Cause and Effect, Purpose and Function, Prepositions, Conditional sentence, modal verbs and use suitable patterns in a given sentence or passage.*

- *Construct appropriate responses to greet, transfer, place the caller on hold, enquires, callbacks, unintentional disconnects, interruptions, using suitable language and telephoning etiquettes. Given a Business communication scenario, construct a suitable strategy and action plan using specific Negotiation tactics consistent with the objectives of the negotiator.*

- *Given a communication context, specify the type and barrier to listening, provide solutions and justify. For a given passage, categorize information, and complete the passage using appropriate vocabulary and grammatical form.*

- *Given a business communication scenario, compose a Business Letters, Memo, Emails, Reports, Minutes Of the Meeting, Technical Proposals, Instructions and Recommendation and checklist using appropriate Language and format. For a given job requirement, prepare a job application letter with resume.*

- *For a given communication content viz., giving Advice and Suggestions, Apologizing, Asking for giving permission, construct dialogues with appropriate functional expressions.*

FOCUS ON LANGUAGE: ENGLISH GRAMMAR & VOCABULARY
Reported Speech – Active Passive Voice – If Clause – Modal Verbs – Verb Preposition Combinations – Confusing Words **–** Abbreviations and Acronyms – Business and Job Related Vocabulary – Relative Clause – Pronouns – Cause and Effect Expressions – Purpose and Function.
(5)

BUSINESS ENGLISH
Telephoning Skills: Understanding Telephone communication – Telephonic Conversations and Etiquettes - Handling Calls – Leaving a Message – Making Requests –Asking for and Giving Information – Giving Instructions - Negotiations: Types of Negotiation –Six Basic Steps of Negotiations – Informal and formal Negotiations **(5)**

READING
Reading a Procedure – Researching for supporting Evidence – Categorizing Information - Cloze Comprehension – Critical Reading: Creative and Critical Thinking - – Reading Proverbs. **(4)**

WRITING

Business Letters – Job Application Letters – Describing a Product and Process – Minutes of the Meeting - Report Writing – Proposal Writing –Memos – Emails - Instructions & Recommendations – Checklist.   **(6)**

LISTENING

Listening to a lecture and sorting information – Listening and filling a mind map – Listening to an interview to create a bio-sketch – Types of Listening – Barriers of Effective Listening – Intensive Listening.   **(4)**

SPEAKING

Group Communication: Forms of Group Communication – Using Body Language in GroupCommunication – Discussions – Group Discussions - Organizational GD – GD as a Part of Selection Process - Interviews: Objectives of Interviews – Types of Interviews – Job Interviews – Apologizing – Discussing an Advertisement – Giving Advice and Suggestions – Asking for and Giving Permission – Meetings.   **(6)**

Total   : 30 Hours

TEXT BOOKS

1. Sudharshana N. P &Savitha C, "English for Technical Communication", CUP, 2016.

2. Meenakshi Raman, Sangeeta Sharma, "Technical Communication – Principles and Practice", Oxford University Press, New Delhi, 2015, 2015.

REFERENCE BOOKS

1. Jack C Richerds, "Interchange - 2", CUP, Fourth Edition, Chennai, 2015.

2. Sudharshana N. P &Savitha C, "English for Engineers", CUP, 2018

3. Ronald Carter, Michael McCarthy. "Cambridge Grammar of English" Cambridge University Press, 2011.

4. Michael McCarthy and Felicity O'Dell, "English Vocabulary in Use", Cambridge University Press, 2012.

5. Mark Ibbotson. "Cambridge English for Engineering" Cambridge University Press, 2012.

19FYG21 BASIC GERMAN

Contact Hours

L	T	P	C
2	0	1	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

- *Understand the fundamental concepts of the Language*

- *Write simple narration and description and speak to communicate idea.*

- *Demonstrate confidence in Social Interactions.*

EINFUHRUNG

BegrUung - Name - Vorname - Familienname - Anrede   **(5)**

THEMA

Hallo! Wiegeht's?

Begegnungen

Guten Tag, ichsuche…,

ImSupermarkt

Arbeit und Freizeit

Familie und Haushalt   **(7)**

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 : unbestimmterundnegativerArtikel

Adjektive : Akkusativ-Erganzung   **(10)**

GRAMMATIK-II

ArtikelalsPronomen Dative - Erganzung :Personalpronomen und Ortsangaben; ImperativModalverben; Ortsangaben; Richtungsangaben; Zeitangaben; OrdinalzahlenPossessiv - Artikel; trennbare und nicht

trennbareVerben; Wechselprapositionen   **(8)**

TOTAL: 30 Hours

TEXT BOOK

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

REFERENCE BOOK

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

19FYF21 BASIC FRENCH

Contact Hours

L	T	P	C
2	0	1	2

PRE-REQUISITES
 Consent of the Instructor
ASSESSMENT: THEORY

COURSE OUTCOME

- *Understand the basics of the Language*

- *Write simple narration and description and speak to communicate idea.*

- *Demonstrate confidence in Social Interactions.*

INTRODUCTION   (2)

UNITÉ-1

Faire connaissance - inviter etrépondre à une invitation - décrire les personnes- articles définisetindéfinis - genre etnombre des noms et des adjectifs- interrogation et négation - conjugaison du présent. Paris monuments et lieux publics - la vie de quatreparisiens de professions différentes.   (7)

UNITÉ-2

Exprimer l' ordreetl'obligation demander et commander - evaluer et apprécier- féliciter et remercier - articles partitifs -adjectifsdémonstratifs et possessifsprépositions et adverbes de quantité et de l'imperatif verbespronominaux - unerégiondeFrance la Bourgogne - vie quotidienne à la compagne.   (6)

UNITÉ-3

Raconteretrapporter - donner son avis - se plaindreetréprimander - expliqueret justifier - pronomscompléments -futurproche - passé composé et imparfait. Plusieursrégions de France - différentsunivers sociaux.   (7)

UNITÉ-4

Demander l'autorisation - interdire - formuler des projects - discuteretdébattre. Pronoms< en >et< y > - pronomsrelatifs et superlatifs - conjugaison du futur - présentcontinu et passé récent.La vie administrative etrégionale - problems economiques et écologiques - traditions et modernité.   (8)

TOTAL: 30 Hours

TEXT BOOK

1. Le Nouveau Sans Frontières - Philippe Dominique, Jacky GirardetMichèleVerdelhan, Michel Verdelhan

REFERENCE BOOKS
   1. Dondo Modern French Course ---MathurinDondo

   2. Modern French Grammar---Margaret Lang and Isabelle Perez.

20MSS21–PROBABILITY AND STATISTICS – I

Contact Hours

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L	T	P	C
3	1	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY
COURSE OUTCOME:

- Gain *knowledge in various probability distributions and their applications*
- *Able to understand joint probability distributions and their uses.*
- G*ain knowledge in sampling and various methods of sampling from population data.*
- A*pply various statistical tests of hypothesis used in data analysis.*
- U*nderstand the meaning of association between two variables and use regression analysis in prediction.*

PROBABILITY DISTRIBUTIONS

Review of basic concepts in Probability

Random variables and their probability distributions-Discrete and Continuous random variables-probability mass function and cumulative distribution functions -definition – Mathematical expectation-mean and variance– Chebyshev's theorem -Important discrete distributions: discrete uniform,Bernoulli, Binomial, Poisson,Geometric, Negative binomial and Hyper Geometric distributions-Continuous distributions: probability density functions and cumulative probability distributions- Continuous Probability Distributions: Normal distribution, its properties and applications,Uniform, Exponential, Gamma, Beta, Chi-square,Log normal,Weibull distributions and their properties- Partition of a sample spaceandBaye's Theorem (with proof)-Simple applications **(15)**

JOINT PROBABILITY DISTRIBUTIONS

Joint and Marginal Probability mass functions(for discrete) and density functions(for continuous). Conditional probability distributions-conditional mean and variance-Independence of random variables-Covariance of random variables-mean and variance of linear combination of random variables. **(6)**

SAMPLING

Population and sample- sampling and its need –sampling vs complete enumeration –parameter and statistics-Probability sampling and –randomsampling- simple random sampling , lottery method and random number table method- stratified random sampling-sampling distribution and standard error of a statistic- sampling distribution of mean and variance (statement only)- t-distribution and F-distribution-Central Limit Theorem. **(7)**

HYPOTHESIS TESTING

Test of significance – Basic concepts – null hypothesis – alternative hypothesis –Type 1 and Type 2 errors- level of significance – Standard error and its importance – steps in testing-One and two tailed tests-The use of p-values for Decision making – Large sample tests and Small sample tests for : Single sample: Testing on a single mean with variance known and variance unknown-Two samples-tests on means –One sample test on a single proportion-two sample tests of two proportions-Goodness of Fit tests, One and two sample tests concerning variances-Tests of independence for categorical data, F test for comparing two variances-tests for homogeneity of variances. (9)

CORRELATION AND REGRESSION
Definition of correlation **-** Scatter plot –Karl Pearson's correlation coefficient its properties–Definition of Regression – Simple regression-Regression of x on y and y on x - fitting regression equation by the method of least squares-properties of regression coefficients -Spearman's rank correlation coefficient-Multiple regression with two independent variables-fitting and interpreting the regression coefficients. **(8)**

Tutorials : 15 Hours

TOTAL: 60 Hours

TEXT BOOKS

1. Gupta,S.C. – "Fundamentals of Statistics", 7th revised and enlarged edition, - Himalaya Publishing House, New Delhi (2013)
2. Gun, A.M., Gupta, M.K. and B. Dasgupta, "Fundamentals of Statistics", Vol.1.World Press, Kolkatta, 2013.

Reference Books
1. Spiegel, Murray R , John Schiller et.al.(2017): Schaum s Outline of Theory and Problems in Statistics, Schaum's Outline Series, 4th edition

2. 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.

3. Michael Baron, "Probability and Statistics for Computer Scientists", 2nd edition, CRC Press

20MSS22-DATA STRUCTURES AND ALGORITHMS

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Contact Hours			
L	T	P	C
3	1	0	4

PRE-REQUISITES

20MSS15

ASSESSMENT: THEORY

COURSE OUTCOME

- *Demonstrate the properties, interfaces, and behaviors of basic abstract data types.*
- *Describe how the various data structures are represented in memory and used by algorithm.*
- *Select basic data structures and algorithms for autonomous realization of simple applications.*
- *Assess how the choice of data structures and algorithm design methods impacts the performance of programs.*
- *Design and implement general-purpose, reusable data structures that implement one or more abstractions.*

BASIC CONCEPTS

Definition of an Algorithm -Basic Steps in Development of an Algorithm –Recursive Algorithms – Data Abstraction – Performance Analysis– Space Complexity – Time Complexity – Asymptotic Notation **(9)**

ARRAYS

Definition –Dynamically Allocated Arrays - one dimensional array, two dimensional array, Polynomials – The Abstract Data Type – Polynomial Representation – Polynomial Addition - Sparse Matrices – The Abstract Data Type- Sparse Matrix Representation – Transposing a Matrix – Matrix Multiplication. **(9)**

STACKS AND QUEUES

Stacks – Primitive Operations – Application of Stacks- Evaluation of Expressions – Evaluating Postfix Expression – Infix to Post Fix

Recursion: Definition – properties – examples – writing recursive program

Queue – Primitive Operations - Circular Queues - Multiple Stacks and Queues **(9)**

LINKED LISTS

Singly Linked List –Linked Stacks and Queues – Polynomial Addition – Circular Linked Lists – Equivalence Relations – Doubly Linked Lists **(9)**

SORTING

Introduction -Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort.

SEARCH STRATEGIES

Linear Search -Binary Search. **(9)**

Tutorial :15
TOTAL: 60 Hours

TEXT BOOKS

1. Ellis Horowitz &SartajSahani, "Fundamentals of Data Structures", Galgotia Publications, 1994.

2. Ellis Horowitz, Sahni& Susan Anderson-Freed, " Fundamentals of Data Structures in C", Universities Press, Second Edition

REFERENCE BOOKS

1. Anany Levitin, "Introduction: The Design & Analysis of Algorithm", Pearson Education Inc., 2003.

2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein "Introduction to Algorithms", Second Edition, Prentice Hall of India, Publications, New Delhi, 2007.

3. Aaron M. Tenenbaum ,Yedidyah Langsam and Moshe J.Augenstein, "Data structures using C & C++" , Prentice Hall, 2012.

4. Krishnamoorthy R, "Data Structures using C", McGraw-Hill Education (India) Pvt. Ltd, 2010.

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY
COURSE OUTCOME

- *Understand the purpose of Web Servers and its functionalities*

- *Create responsive user interface web pages using HTML5, CSS and BOOTSTRAP*

- *Design and validate richly interactive web pages using AJAX, JSON, jQuery*

- *Employ Java Script for client side programming that uses a regular expression to validate form entry and processing and event handling*

- *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 and World Wide Web – Web basics – Multitier Application architecture – Client side scripting versus Server side scripting – W3C   **(4)**

HTML5
Introduction to HTML5: Basic Tags – Headings – Links – Images – Special characters - Horizontal rules – Lists- Tables- Frames – Forms- Meta element- New form input types – Data list Elements and Auto complete Attribute – Page structure elements, HTML Graphics: Canvas   **(8)**

CSS AND BOOTSRAP
CSS Introduction - Inline Styles - Embedded Style Sheets - Conflicting Styles - Linking External Style Sheets - Positioning Elements: Absolute Positioning, Relative Positioning - Backgrounds - Element Dimensions -Box Model and Text Flow, **Cascading Style Sheet (CSS3):** Introduction- Text Shadows- Rounded Corners – Color - Box Shadows - Linear Gradients - Radial Gradients - Text Stroke - Multiple Background Images – Reflections - Image Borders – Animation – Selectors - Transitions and Transformations - Downloading Web Fonts - Flexible Box Layout Module - Multicolumn Layout - Media Queries, **Bootstrap:** Introduction to Bootstrap – grid – button – cards – navbar – dropdown – carousel – forms - alerts   **(8)**

JAVA SCRIPT
Introduction to scripting - Control Statements - Functions - Arrays - Objects – Collections – Event handling, Introduction to JSON- JSON syntax – JSON parsing – JSON serialization, Introduction to jQuery – validations - events, Introduction to AJAX: Traditional Web Applications, Ajax Applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax, Ajax Example Using the XMLHttpRequest Object, Using XML and the DOM, Creating a Full-Scale Ajax-Enabled Application using JSON   **(15)**

PHP

Introduction – simple PHP program - converting between data types – Arithmetic operators – Arrays – String comparisons – String processing with regular expressions – Form processing and Business logic – Reading from a database – Cookies – Dynamic content **(10)**

TOTAL : 45 Hours

TEXT BOOKS

1. *Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", fifth edition, Pearson Education, 2011.*

REFERENCE BOOKS

1. *Nicholas C. Zahas, "Professional - Java Script for Web Developers", Third Edition, John Wiley & Sons Inc,2012.*
2. *Jon Duckett, "Beginning HTML, CSS, and JavaScript", Wiley Publishing, 2010.*
3. *Ethan Brown, "Learning JavaScript", Third Edition, O'Reilly Media Inc, 2016.*
4. *Jorge Krause, "Introducing BOOTSRAP 4", Apress, 2016.*
5. *Ben Smith, "Beginning JSON", Apress, 2015.*
6. *David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011.*

WEB REFERENCES

1. *https://www.w3schools.com/html/*
2. *https://www.w3schools.com/js/js_json_intro.asp*
3. *https://www.w3schools.com/js/js_jquery_elements.asp*
4. *https://www.w3schools.com/bootstrap4/*
5. *https://developer.mozilla.org/en-US/docs/Web/*

20MSS24 - OBJECT ORIENTED PROGRAMMING

Contact Hours

PRE-REQUISITES
Consent of the Instructor

L	T	P	C
3	0	0	3

ASSESSMENT: THEORY
COURSE OBJECTIVE

- *For a given scenario compare and criticize alternate implementations using functional programming and object oriented programming in view of privacy.*

- *Create persistent objects using stream class hierarchy incorporating exceptional handling.*

- *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.*

INTRODUCTION
Introduction to OOP and its basic features - Basic components of a C++ - Program and program structure - Compiling and Executing C++ Program- Selection control statements in C++ - Arrays, Pointers, Structures, References and Functions – Function Overloading - Name spaces – Source Files and Programs. **(9)**

OBJECT AND CLASSES
Classes and Abstraction: Classes objects, data members, member functions, Const member functions - this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions- Inline function definition – Concrete classes – Abstract classes - Constructors-Destructors - new and delete – Member objects- A string class - Dereferencing. **(9)**

STREAMS AND FILES
Streams classes - Stream Errors - Disk File I/O with streams - File pointers - Error handling in file I/O with member function - Command line arguments. **(6)**

INHERITANCE AND POLYMORPHISM
Inheritance: Introduction and benefits - Access Specifier - Base and Derived Class Constructors - Types of Inheritance - Down casting and up casting- Virtual base class. Polymorphism: Defining Operator Overloading - Overloading Unary Operators - Overloading Binary Operators - Overloading Binary Operators using Friends - Manipulation of Strings using Operators - Rules of Operator Overloading - Type Conversion.Function Overriding- Virtual functions – Pure virtual function.
(13)

TEMPLATES AND EXCEPTIONS
Function templates, Class templates. Exceptions-Grouping of exceptions - Catching exceptions – Exceptions that are not errors – Uncaught Exceptions – Standard exceptions. **(8)**

Total: 45 Hours

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

2. Tony Gaddis, "Starting Out with C++ from Control Structures to Objects ", 8th edition, Pearson Education, 2014.

REFERENCE 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.

20MSS25 WEB APPLICATION DEVELOPMENT LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME
- *Create new websites or enhance the existing websites to be more responsive using HTML5, CSS and BOOTSTRAP*

- *Build richly interactive web pages using AJAX, JSON, and jQuery*

- *Perform client side programming using JavaScript that uses a regular expression to validate form entry and processing and event handling*

- *Develop PHP server side programming to build interactive, data-driven sites to work with form data, regular expressions, exception handling and validations*

CONCEPTS TO BE COVERED
- Create web pages using HTML formatting tags, tables, images, lists and frames

- Create interactive pages using anchors, image maps and forms

- Design responsive webpages using CSS, BOOTSTRAP

- Create an online Registration form for a website and validate using jQuery

- Handle the form submission using AJAX

- Construct a JSON structure for an application and validate it using JSON and use jQuery for parsing

- Create a Single Page Application using Bootstrap and jQuery for designing the User Interface

- Develop Java Script Programs for Arithmetic, String processing, Arrays, built-in and user defined functions, client side validations and even handling

- Develop a fully functional web application using PHP and MySQL with validations

20MSS26-DATA STRUCTURES AND ALGORITHMS LAB

PRE-REQUISITES

20MSS15

ASSESSMENT: PRACTICAL

Contact Hours			
L	T	P	C
0	0	4	2

COURSE OUTCOME

- *Selection and application of suitable data structures in implementing practical problems.*
- *Demonstrate the abstract properties of various data structures such as stacks, queues and linked lists.*
- *Trace and code recursive methods and compare with iterative methods*
- *Apply sorting algorithms that suit the given problem statement.*
- *Demonstrate understanding of linear and binary search algorithms*

Applications of the following data structure constructs:

1. Sparse and dense Matrix operations using arrays.

2. Stacks using array representation.

3. Conversion of infix expression to postfix expression and evaluation.

4. Queues using array representation.

5. Linked Lists: Singly linked, doubly linked and Circular lists and applications.

6. Linked Stacks.

7. Linked Queues.

8. Expression Processing.

9. Sorting algorithms-Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort.

10. Searching algorithms-Linear search, Binary search.

15MSS27 - OBJECT ORIENTED PROGRAMMING LAB

	Contact Hours		
L	**T**	**P**	**C**
0	0	4	2

PRE-REQUISITES
Consent of the instructor

ASSESSMENT: PRACTICAL

COURSE OBJECTIVE

- *Determine the visibility requirements for data members and member functions and communication requirements among objects while constructing classes for a given scenario.*

- *Create persistent objects using iostream class hierarchy incorporating exceptional handling.*

- *Demonstrate static binding using function overloading and operator overloading for manipulating real-life objects.*

- *For a given scenario, construct an object oriented system using appropriate type of inheritance for realizing reusability.*

- *Design object oriented system for realizing run time polymorphism using dynamic binding.*

Applications exploiting the following features of OOPS:

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

20MSS28- ENGLISH FOR EMPLOYABILITY

Contact Hours

L	T	P	C
0	0	2	1

PRE-REQUISITES
Consent of the instructor

COURSE OUTCOME

- *Given strictly timed objective questions on logical sequence of words, sequential order of things, comparison, and sentence correction, solve within the given time.*

- *For a given specific speaking task on topics like JAM, Describing an object, book review and extempore generate ideas and speak confidently.*

- *For a given social situation viz., Travel and Transport, complaining, giving instructions, advising and sympathizing, requesting and warning people, communicate effectively to peer using appropriate functional language.*

- *For a given HR topic, generate valid points for and against the topic and present them with appropriate group behaviour. For any job requirement, plan and prepare a 20 min HR mock interview.*

UNIT – 1
Ice Breakers - Just a Minute - Book Reviews - Describing an object – Extempore – Paraphrasing.
(6)

UNIT – II
Spoken English - Travel and Transport, Complaining - Giving Instructions, Advising and Sympathizing – Requesting and warning people **(5)**

UNIT – III
Logical Sequence of Words- Exercises - Sequential Order of Things - Comparison Type Questions – Introduction and Exercises - Idioms and Phrases - Types and Exercises - Vocabulary through Mythology - One word Substitutes, Word Power Exercises - Common Errors in English - Sentence Correction **(7)**

UNIT – IV
Activity based on newspaper articles - Vocabulary – Homophones and Homonyms - Reading Prose – Reading Comprehension Activity **(4)**

UNIT – V
Professional Communication - Mock Group Discussion – Mock Interview – Telephoning Skills – Personality Development Activities. **(8)**

TOTAL: 30 Hours

20MSS31- THEORETICAL COMPUTER SCIENCE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

C01 : *Apply logical reasoning in verifying the correctness and validity of simple instances of valid logical arguments.*

C02 : C*onstruct system models which are the natural extension of automata that are used to devise decision procedures.*

C03 : *Ability to specify languages using grammars.*

C04 : *Ability to solve problems in Pushdown Automata and Turing machines.*

C05 :*Identify to devise encoding and decoding procedures for error detection and correction in data transmission problems.*

MATHEMATICAL LOGIC

Propositional Logic – Statements – Logical Connectives – Truth tables – Tautologies and Tautological Implications – Equivalences - Normal forms - Predicate Calculus.   (10)

MACHINES

Basic machine – FSM - Deterministic & Non deterministic - Equivalence of DFA & NFA finite automata with € - transitions - Regular expressions - Equivalence of regular expression and finite automata - Grammars: Definition - Types - Leftmost, Rightmost Derivations-Syntax trees-Ambiguity.

(10)

PUSHDOWN AUTOMATA and TURING MACHINE

Deterministic & Non deterministic PDA - Acceptance by empty stack and final state. Designing a PDA. Turing machine - Types - Representations - Acceptance - Halting problem - Rice theorem.   (9)

ALGEBRAIC STRUCTURES I

Rings, Integral domains and fields - Properties of Rings - Construction of finite fields-Irreducible Polynomials - Primitive element of a finite field- Primitive Irreducible Polynomials.   (8)

ALGEBRAIC STRUCTURES II

Residue arithmetic for Computers- Coding theory - Error Detection - Correction - Distance between Code words - Minimum distance and weight - Group Code , Linear Code and Cyclic code - Problems under Encoding and Decoding Techniques.

(8)

Total: 45 Hours

TEXT BOOKS

1. *J*.P.Tremblay, R. Manohar, "Discrete Mathematical structures with Applications to computer science", Tata McGraw - Hill, Edition, 1997 , Thirty Eighth reprint , 2010. (Para 1,5)

2. Ralph P.Grimaidi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Addison Wesley Publishing Company, Fifth Edition, Pearson Education, Second Impression, 2008. (Para 4)

3. Hopcroft J.E., Motwani R., Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2009. (Para 2,3)

REFERENCE BOOKS

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw -Hill, Seventh Edition, 2012.
2. John C Martin , "Introduction to Languages and the Theory of Computation" , Third Edition , Tata McGraw Hill Publishing Company , New Delhi, Seventh reprint ,2010.
3. Mishra K.L.P, Chandrasekaran N. "Theory of Computer Science: Automata, Languages and Computation", Prentice Hall of India, Third edition, 2008.

20MSS32 – PROBABILITY AND STATISTICS – II

Contact Hours

L	T	P	C
3	1	0	4

PRE-REQUISITES

20MSS21

ASSESSMENT: THEORY

COURSE OUTCOME

> C01 : *Apply moment generating function and transformation of variables to determine the probability distributions of transformed variables.*

> C02 : *Gain good knowledge in estimation of parameters of probability distributions using classical and Bayesian approaches.*

> C03 : *Formulate and compute multiple linear regression models and intercept it.*

> C04 : *Develop skill to analyze data from statistical experiments using appropriate Statistical Design of Experiments.*

> C05 : *Gain knowledge in computing reliability of systems for life testing and construct Control Charts.*

FUNCTIONS OF RANDOM VARIABLES

Moments and Moment Generating Functions (MGF)- definition- Properties - MGFs of important distributions-Theorems on MGFs- Transformations of Variables and finding their distributions -method of direct transformation and method of moment generating functions.

(8)

ESTIMATION

Estimation of parameters using method of moments-Maximum Likelihood Point Estimation(MLE) –Properties of estimators-Unbiasedness, minimum variance, efficiency and sufficiency-Mean Square Error-Asymptotic properties-consistency-Fisher Information and Cramer-Rao's Inequality – Interval Estimation-Confidence interval for the mean of single sample –Bayesian Concepts-Subjective Probability- Conditional Perspective-Bayesian Inferences-Prior and

posterior distributions- Point Estimation using the posterior Distribution- Bayesian Interval Estimation-Bayes Estimates using Decision Theory framework: Bayes estimate under squared error loss function and absolute error loss function.

(14)

MULTIPLE REGRESSION ANALYSIS (MLR)

Variables in Multivariate Data-Mean Vector, Covariance and Correlation Matrices and their properties - Estimation of missing values. Multiple Linear Regression Equation and Polynomial Regression Models- Estimation of the coefficients using method of least squares–Linear Regression using Matrices-Properties of Least Squares-Inferences in Multiple Linear Regression: ANOVA and testing the partial regression coefficients- Interpretation of R^2-Standardized Regression Coefficient and its interpretation-Inclusion of categorical or indicator variables in MLR –Multi-collinearity problem-Stepwise Regression**.**   **(8)**

APPLIED STATISTICS:DESIGNS OF EXPERIMENTS

Analysis of Variance (ANOVA) technique-Design of experiments – basic concepts – treatment – experimental unit –experimental error - basic principle – replication, randomization and local control-One way Analysis of Variance : Completely Randomized Design- Randomized blocks design – description – layout – analysis-Latin Square Design-description-layout-analysis.

(8)

APPLIED STATISTICS: RELIABILITY AND QUALITY CONTROL

Concepts of reliability-hazard functions-Reliability of series and parallel systems- Control Charts-Nature of Control Limits-Purpose of Control Charts-Control Charts for Variables (and R charts)-Control Charts for Attributes(p, c and np charts)-CUSUM charts**.**

(8)

Total: 46 Hours

Tutorial : 14 Hours

Total : 60 hours

TEXT BOOKS

1. Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Inc., 7th Edition, Delhi, India, 2002.[Para 1, 2,4,5]

2. Alvin C.Rencher. "Methods of Multivariate Analysis", 2nd Edition, Wiley Inter-science, 2002 [Para 3]

REFERENCE BOOKS

1. Michael Baron, "Probability and Statistics for Computer Scientists", 2nd edition, CRC Press,2014.

2. Meyer, Paul L., "Introductory Probability and Statistical Applications", Addision Wesley, 2nd Edition, 1970.

3. S. C .Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 10th Revised Edition, New Delhi, 2002.

4. S.C. Gupta ,"Fundamentals of Statistics", 7th and Enlarged Edition, Himalaya   Publishing, Delhi, 2014.

20MSS33 - ADVANCED DATA STRUCTURES

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS22

ASSESSMENT: THEORY

COURSE OUTCOME

    CO1 : Illustrate the applications of advanced data structures.

    CO2 : Understand the ADT and use it to design algorithms for a given problem.

    C03 : Choose the appropriate data structures for a given real-world problem.

    C04 : Choose the right algorithm to solve a given problem.

    CO5 : Assess the trade-off on the choice of data structures and algorithms for performance analysis.

TREES : Definition - Binary Trees: Representations, Traversal, Properties - Threaded Binary Trees - Copying and Equivalence of Binary Trees .

(6)

Binary search tree: Definition, operations - AVL Tree: Balancing trees, node operations-splay trees.

(8)

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)

DYNAMIC STORAGE MANAGEMENT

First Fit - Best Fit - Storage Release - Boundary Tag Method - Buddy System - Garbage Collection -Compaction.

(5)

Total : 45 hours

TEXT BOOKS

1. Ellis Horowitz & Sartaj Sahani, "Fundamentals of Data Structures", Galgotia Publications, 1994.
2. Ellis Horowitz, Sahni & Susan Anderson-Freed, " Fundamentals of Data Structures in C", Universities Press, Second Edition,2008.

REFERENCE BOOKS

1. Aaron M. Tenenbaum, YedidyahLangsam and Moshe J.Augenstein, "Data structures using C & C++", Prentice Hall, 2012.
2. Krishnamoorthy R, "Data Structures using C", McGraw-Hill Education (India) Pvt. Ltd, 2010.

20MSS34 - COMPUTER ARCHITECTURE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS14

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Given a computer organization, demonstrate how the various computer system components work and justify why they perform so.

C02 : Given the instruction set of a processor, develop assembly language programs that meet the given requirements.

C03 : Given a CPU organization, design a memory module for a given specification.

C04 : Given a CPU organization, design an I/O module for a device by choosing appropriate mode of transfer and justify choice.

C05 : Given the instruction set, format of the instructions, and cycles needed for execution, can evaluate the execution time of the program and explain how pipelining improves the execution time.

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 – Parallel Processing – Pipelining – Arithmetic and Instruction pipeline

(9)

COMPUTER ARITHMETIC

Addition - subtraction - multiplication and division algorithms - Floating point Arithmetic operations – Decimal arithmetic unit and operation.

(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 Hours

TEXT BOOK

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

REFERENCE BOOKS

1. *J*ohn 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.

20MSS35 - OPERATING SYSTEMS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Ability to comprehend the techniques used to implement the process manager.

CO2 : Ability to apply inter-process communication and synchronization techniques.

C03 : Design scheduling algorithms to compute various scheduling criteria.

C04 : Able to implement page replacement algorithms, memory management strategies

C05 : Ability to comprehend the different file allocation and access techniques.

INTRODUCTION : Operating system objectives and functions – The evolution of Operating systems- Linux- Linux Vserver virtual machine architecture. Process Description and Control - Process states, Process description, Process control .Processes and threads – Types of threads – Linux process and Thread management.

(10)

CONCURRENCY : Principles of concurrency, mutual exclusion: hardware support- Semaphores - Monitors - Message Passing. **Deadlock and Starvation:** Principles of Deadlock, deadlock prevention, deadlock avoidance, deadlock detection. Linux Kernel Concurrency Mechanisms.

(8)

MEMORY MANAGEMENT

Memory management requirements, Memory partitioning, Paging, Segmentation.

Virtual Memory: Hardware and Control Structures, Operating System Software, Linux Memory Management. (12)

UNIPROCESSOR SCHEDULING

Types of Processor Scheduling**,** **S**cheduling Algorithms.
(6)

I/O MANAGEMENT, DISK SCHEDULING AND FILE MANAGEMENT

I/O Devices, Organization of the I/O function, Operating System Design Issues, I/O buffering, Disk Scheduling, RAID, Linux I/O.

File Management: Overview, File Organization and Access, File directories, File sharing, Secondary Storage Management, Linux virtual file system.

(9)

TOTAL : 45 Hours

TEXT BOOK

1.   *William Stallings, "Operating systems Internals and Design Principles", 7th edition, PHI, 2012.*

REFERENCE BOOKS

1.   *Umakishore Ramachandran, William D. Leahy Jr., "Computer Systems: An Integrated Approach to Architecture and Operating Systems", International Edition, Pearson, 2011.*
2.   *Silberschatz A., Greg Gagne and Galvin P., "Operating System Concepts", John Wiley Publishing Company, Ninth Edition,2013.*
3.   *Andrew S Tanenbaum, "Modern Operating Systems",4th Edition, Pearson Publications, 2014.*

20MSS36   PYTHON PROGRAMMING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : Write, test, and debug simple Python programs.

CO2 : Implement Python programs with conditionals and loops.

CO3 : Use functions for structuring Python programs.

CO4 : Represent compound data using Python lists, tuples, and dictionaries.

CO5 : Read and write data from/to files in Python and data exploration.

CONCEPTS TO BE COVERED

1. Python installation, python interface and python IDE.

2. Python constructs

    a. Jump/branching

    b. Loops

    c. Functions

    d. Variables and their scope

    e. Modules

f. Operators and expressions

3. Importing/exporting data in python

4. Exceptions handling in python

5. Collections and dictionaries

6. Object oriented programming in python

7. Working with files in python

8. Data exploration in python

a. Working with data in python

b. Data modelling using machine learning techniques

20MSS37-ADVANCED DATA STRUCTURES LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : *Apply tree data structures and its variants for real time applications.*

CO2 : *Select and apply suitable data structures in implementing practical problems.*

CO3 : *Derive time complexity theoretically for different algorithmic design techniques.*

CO4 : *Identify suitable graph based algorithms and apply them for solving problems that arise in real world scenarios.*

CO5 : *Implement Hash Table techniques for a given application.*

CONCEPTS TO BE COVERED

1. Binary trees (with graphical representation)

2. Threaded trees (with graphical representation)

3. Applications of Binary search trees and its operations

4. Operations on AVL tree including rotations

5. B-Tree and its operations

6. Operations on Red Black trees

7. Problems related to graphs and graph traversals

8. Construction of heap & its operation

9. Implementation and analysis of Hash Table with collision handling.

20MSS38 - OPERATING SYSTEMS LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

> *CO1 : Able to comprehend the techniques used to implement the process manager.*
>
> *CO2 : Able to apply and analyze inter process communication and synchronization techniques.*
>
> *CO3 : Able to design scheduling algorithms and its variants to compute various scheduling criteria.*
>
> *CO4 : Ability to implement page replacement algorithms, memory management strategies*
>
> *CO5 : Ability to comprehend the different file allocation and access techniques.*

CONCEPTS TO BE COVERED

1. Shell Basics
2. Command Line arguments
3. Functions and file manipulations
4. Regular Expression & Filters (grep, cut, sort,grep patterns)
5. Text processing commands- SED & AWK
6. Shell Programming
7. Implementation of Process Creation and Termination
8. Pthreads programming
9. Implementation of Threading & Synchronization Applications
10. Implementation of IPC
11. Modifying/Debugging Minix 3 source code
12. Implementation of various CPU Scheduling Algorithms
13. Implementation of Bankers Algorithm to avoid deadlock
14. Implementation of Deadlock Detection Algorithm
15. Implementation of the following Memory Allocation Methods for fixed partition

a)First Fit b) Worst Fit c) Best Fit

16. Implementation of the following Page Replacement Algorithms
   a)FIFO b) LRU c) LFU
17. Implementation of the following File Allocation and Access Methods
   a)Sequential b) Indexed c) Linked

20MSS41- RESOURCE MANAGEMENT TECHNIQUES

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
 Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : S*olve linear Programming, Transportation and Assignment based problems.*

CO2 : *Explain the elementary Inventory models, Price break models and Safety stock problems.*

CO3 : *Solve Job sequencing and replacement problems.*

CO4 : *Categorize the Queuing models and also simulate problems using Monte - Carlo Technique.*

CO5 : *Analyze the network models using CPM and PERT.*

LINEAR PROGRAMMING

 Linear programming problem - canonical and standard forms - formulation - graphical solution– simplex method-Big M method using artificial variables- **Transportation model** – Initial Basic Feasible Solution using North West Corner method, Matrix Minima method and Vogels approximation method – Optimal solution by Modified Distribution Method-Unbalanced Transportation problems and Degeneracy - **Assignment model**-Solution by using Hungarian method. **(12)**

SEQUENCING AND REPLACEMENT

 Sequencing: Basic assumptions – Johnson's procedure for Sequencing of: i) n jobs on 2 machines ii) n jobs on 3 machines and iii) n jobs on m machines

 Replacement: Need for replacement of equipments - failure mechanism of items - Replacement policy - Replacement of items that deteriorates gradually - Replacement of items that fail suddenly. **(7)**

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

Queuing system characteristics-Describing a queuing system by i) input pattern ii) service mechanism iii) queue discipline and iv) customer behaviour- Steady, transient and explosive states in queuing systems-Designation of queue and symbols used in queuing models- M / M / 1 (∞ / FIFO) model-Steady State solutions-Finite Queue Length Model: (M / M / 1) : (N / FIFO)

(8)

PERT & CPM NETWORKS

Activities and events-Rules for forming a Network-**Critical Path Method**(CPM) for computing project completion time- network – Time estimation in CPM-Project Cost Analysis- critical path -Crashing-Least cost schedule algorithm- **PERT** :Network – Difference between PERT and CPM-Time estimates in PERT- Critical Path estimation - Probability of meeting a scheduled date of completion of the project. **(9)**

TOTAL: 45 Hours

TEXT BOOK

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

REFERENCE BOOKS

1. Rama Murthy P. Operations Research, New Age International, Second Edition, 2007, New Delhi

2. S. D. Sharma "Operations Research ", Kedar Nath ram Nath & co publishers, 10th edition, 1995.

3. Kanti Swarup, P.K. Gupta, Mani Mohan, "Operations Research", Sultan Chand & Sons, 2001.

4. Hillier & Lieberman, "Operations Research - An Introduction", Tata McGraw-Hill, 2004

20MSS42 MICROPROCESSORS AND MICROCONTROLLERS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS14

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Describe the internal architecture of 8086 processor and the bus structure.

CO2 : Develop optimized assembly language programs exploiting appropriate addressing modes.

CO3 : Given an assembly code, explain how the building blocks of a 8086/ARM based system interact and execute the code.

CO4 : Illustrate the interfacing of I/O and Memory units to the processor.

CO5 : Explain how concurrency in software is realized at the processor level.

Architecture: 8086 Architecture - Instruction Format - Instruction Types - Assembler Directives and Operators - Assembly Process - Assembly Language Programming. **(9)**

Modular Programming: Linking and Relocation - Stacks - Procedures - Interrupts and Interrupt Routines - Macros - Program Design - Program Design Example.

I/O Programming: Fundamental I/O Considerations - Programmed I/O - Interrupt I/O - Block Transfer and DMA - I/O Design.

Memory Interfacing: General Memory organization - Static and Dynamic RAM Devices - ROM Devices. **(9)**

Introduction to Multiprogramming: Process Management and iRMX89 - Semaphore operation - Common procedure Sharing - Memory Management - Virtual Memory in 80286.

System Bus Structure: Basic 8086/8088 configuration - System Bus Timing - Interrupt Priority Management.

I/O Interfaces: Serial Communication Interfaces - Parallel Communication - Programmable Timers and counter Events - DMA Controller - Maximum Mode Design.

(9)

Multi-core Architecture: Motivation in concurrency in software - Parallel computing Platforms - Performance - System view of Threads - Virtualization on systems - Single-core Processor Fundamentals - Multi-core Processors - Threading on Multi-core Processors.

(9)

Microcontroller: ARM Design Philosophy - Embedded System Hardware and Software - ARM Processor: Registers Pipeline - Exceptions, Interrupts and Vector Table - Core Extensions and Architecture Revisions.

(9)
TOTAL: 45 Hours

TEXT BOOKS

1. Yu – Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086/8088 Family – Architecture, Programming and Design ", Second Edition, Prentice Hall of India, 2007.(Para -1,2,3)

2. Shameem Akhter, Jason Roberts, " Multi-Core Programming- Increasing Performance through Software Multi-threading", Intel Press,2006.(Para-4)

3. Andrew N. Sloss Dominic Symes Chris Wright, "ARM System Developer's Guide Designing and Optimizing System Software", Elsevier Inc 2010.(Para-5)

REFERENCE BOOKS

1. Barry B. Brey, "The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing", Eighth edition, Pearson Prentice Hall, 2009.

2. Intel® 64 and IA-32 Architectures Software Developer's Manual, Volume 3B: System Programming Guide Part 2 .

3. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", Second Edition, 2012.

20MSS43 - SOFTWARE ENGINEERING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS13

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : *Choose applicable software life-cycle model to develop software for given customer need and demonstrate competence in communication, planning, analysis, design, construction and deployment.*

CO2 : *Analyze software requirements based on customer needs and develop industry standard Software Requirement Specification (SRS) document.*

CO3 : *Construct models to represent usecase, class, architecture, modular structure, user interface and deployment using functional and object oriented principles.*

CO4 : *Prepare a suitable test plan, verify adherence of six Sigma and Measure Metrics to deliver quality software.*

CO5 : *Demonstrate an understanding of and apply current theories, models, and techniques in building Web APP for any given problem domain.*

INTRODUCTION : Software Definition - The Software Process - Software Engineering Practice - Software Process Structure - Process Models: Prescriptive Process Models, Specialized Process Models, The Unified Process, Agile Process Models - Quality Assurance at each Phase of SDLC. **(8)**

REQUIREMENT MODELING : Initiating the Requirement Engineering Process – Eliciting Requirements – Developing Usecases - Building the Analysis Model - Scenario-Based Modelling, Class Based Modelling, Creating a Behavioral Model . **(8)**

DESIGN PROCESS : Design Concepts - Design Model: Data Design Element,, Interface Design Element, Component level Design Element, Deployment level Design Element - Architectural Design: Software Architecture, Architectural styles, Architectural Design - Component Level Design: Component Definition, Designing Class-Based Components, - User Interface Design: Interface Analysis, Interface Design.   **(13)**

TESTING AND QUALITY MANAGEMENT: Black Box Testing - White Box Testing - Integration and System Testing- Software Quality Assurance – Formal Technical Reviews - Six Sigma for Software Engineering – ISO 9000 Quality Standards   **(7)**

SOFTWARE PROJECT MANAGEMENT, ESTIMATION AND CASE STUDY :

Project Scheduling: project scheduling – Defining a Task set for software project – Defining a Task network – Scheduling –Software Project Estimation – Decomposition Techniques - Case Study on WebAPP : Web Engineering Process – Requirement Analysis, Navigation Analysis – Web App Interface Design – Architecture Design.   **(9)**

TOTAL: 45 Hours

TEXT BOOKS

1.   Roger S Pressman, "Software Engineering - A Practitioner's Approach", Sixth Edition, McGraw Hill Edition, 2010.

2.   Nina S Godbole "Software quality Assurance, Principles and Practice", Narosa Publishing House, 2004.

REFERENCE BOOKS

1.   Ian Somerville, "Software Engineering", 9th edition, Pearson, 2010.

2.   Rajib Mall, "Fundamentals of Software Engineering", Fourth Edition, Prentice Hall India, 2014.

3.   Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 1st Edition, 2010.

20MSS44 DATABASE MANAGEMENT SYSTEMS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT:THEORY
COURSE OUTCOME

CO1 : *Describe the purpose and architecture of database systems from the perspective of persistent storage of real world data.*

CO2 : *Analyse the system specification, construct the Entity Relationship model and map it into relational model and conform the normal forms.*

CO3 : *Generate Relational Algebra and SQL statements to perform queries of real-world applications.*

CO4 : *Apply appropriate indexing techniques for improving the performance of the given application.*

CO5 : *Able to comprehend various concurrency control, recovery, and access control mechanisms to build multi-user, robust database applications*

BASIC CONCEPTS : Introduction to databases – Conventional file processing – Characteristics of the Database approach– Data Models – Data abstraction - DBMS Architecture– Data Independence – Database Languages – Database System Environment – Advantages and disadvantages of DBMS – Users of DBMS.

DATA MODELING: Introduction – entities, attributes, relationships – Structural and participation constraints – High Level conceptual data model - ER Diagrams (ERD) – Specialization and Generalization Constraints – Enhanced ER diagrams (EER) – Mapping of ER/EER into Relational Schema. **(5 +6)**

RELATIONAL MODEL AND CONSTRAINTS : Introduction – Relational data model – Data Integrity Constraints – Introduction to Relational Algebra – Relational algebra queries.

RELATIONAL DATABASE MANIPULATION: Structured Query Language (SQL) -

-Specifying Constraints- Basic Data Retrieval and Manipulation– SQL Joins – SQL Complex Queries – Views – Advanced SQL- Introduction to NOSQL Database.   **(4+5)**

DATA BASE DESIGN: Functional dependencies – Normal forms based on primary keys – First, Second and Third Normal forms - Boyce Codd Normal form - Multivalued dependencies – Fourth Normal form - Decomposition Algorithms for relational database design.   **(9)**

PHYSICAL DATABASE DESIGN: Storage device characteristics – Constituents of a file – Operations on file – File Organizations -Heap File, Ordered File and Hash File. - Indexing– Primary, secondary and cluster indexes – Indexing using Tree structures. Query Processing and Optimization Techniques.   **(8)**

 TRANSACTION AND SECURITY MANAGEMENT: Introduction – Serializability and concurrency control – Locking techniques - Times Stamping Method – Deadlock - Recovery Techniques – Deferred Update and Immediate Update, Security and Integrity threats – Access Controls and Defence mechanisms.   **(8)**

                                        Total: 45 Hours

TEXT BOOKS

1.   Elmasri R and Navathe SB, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2016.

2.   Silberschatz A, Korth H and Sudarshan S, "Database System Concepts", Sixth Edition, McGraw Hill, 2013.

3.   Bipin C Desai, "An Introduction to Database Systems", Revised Edition, Galgotia Publications Pvt Ltd, 2012.

REFERENCE BOOKS

1.   Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems: The Complete Book," Pearson Education, 2011.

2.   Raghu Ramakrishnan and Johannes Gehrke, "Database Management System", McGraw Hill, 2014.

20MSS45 - JAVA PROGRAMMING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS24

ASSESSMENT: THEORY
COURSE OUTCOME

CO1 : *Given software requirements, design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes.*

CO2 : *Write java programs by employing the object oriented constructs of inheritance and polymorphism for a given software requirement*

CO3 : *For a given software solution, organize the application programs into packages and prepare a deployable application*

CO4 : *Generate robust java applications for a given user requirements by employing applicable object oriented concepts and handling all possible exceptions*

C05 : *Design and develop interactive two tier or three tier applications using Swings and JDBC for the given user specifications*

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)**

INHERITANCE :

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

INTERFACES AND INNER CLASSES

Interfaces - Object Cloning - Interfaces and callbacks – Inner Classes. DEPLOYING APPLICATION: JAR Files - EXCEPTIONS - Dealing with Errors – Catching Exceptions.

(10)

SWING AND EVENT DRIVEN PROGRAMMING

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.

Basics of event driven programming – event handlers – adapter classes – actions – mouse events

(7)

FRAMEWORKS

Tiered Application development - Java Servers, containers –Web Container – Web Frameworks Introduction to Spring/ Play Framework – ORM Layer – Introduction to Hibernate. **(8)**

COLLECTIONS

Collection Interface - Concrete collections - The Collections Framework -Legacy Collections – The Hashtable Class **(5)**

MULTITHREADING - Threads - Interrupting Threads - Thread states. Database Connectivity : JDBC **(8)**

TOTAL: 45 Hours

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.

4. Amritendu De, "Spring 4 and Hibernate 4: Agile Java Design and Development", McGraw-Hill Education, 2015

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 McGraw-Hill, 2004.

3.   Anil Hemrajani, "Agile Java Development with Spring, Hibernate and Eclipse", Sams, 2006

20MSS46 - MICROPROCESSORS AND MICROCONTROLLERS LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : *Develop Assembly code using Intel 8086 instructions set.*

CO2 : *Create simple macro functions.*

CO3 : *Develop simple device drivers.*

CO4 : *Develop simple Assembly modules using FAR and NEAR procedures.*

CO5 : *Develop ARM Processor based simple Applications.*

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.

8.   Developing ARM processor based Simple Applications.

20MSS47 - DATABASE MANAGEMENT SYSTEMS LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : *Design the conceptual data model as Entity Relationship diagram and create the database using DDL statements for a given application.*

CO2 : *Formulate simple DML SQL queries to retrieve the required data for real world applications.*

CO3 : *Generate DML queries with Subqueries, Joins, Group By, Order By and Aggregate functions to filter and aggregate the data of the real world applications.*

CO4 : *Construct reusable PL/SQL blocks with Functions, Procedures, Packages, Triggers, Exception Handling, and Cursors as required by database applications.*

CO5 : *Develop a database project by constructing the Relational Schema, Relations and Indexes and generating SQL and PL/SQL blocks using RDBMS platform.*

CONCEPTS TO BE COVERED

1. Designing conceptual design for a given problem specification

2. Creating and managing relations with referential triggered actions

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

20MSS48 - JAVA PROGRAMMING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : Given software requirements, design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behaviour and hierarchy among the classes.

CO2 : Write java programs by employing the object oriented constructs of inheritance and polymorphism for a given software requirement

CO3 : For a given software solution, organize the application programs into packages and prepare a deployable application

CO4 : Generate robust java applications for a given user requirements by employing applicable object oriented concepts and handling all possible exceptions

CO5 : Design and develop interactive two tier or three tier applications using Swings and JDBC for the given user specifications

CONCEPTS TO BE COVERED

Creating Classes and Objects

Inheritance

Polymorphism

Runtime Polymorphism using Abstract Class and

Interface Packages

Exceptions Multithreading Collections Swings

Event Handling

JDBC

Using frameworks – Spring and Hybernate

20MSS49 - PERSONALITY DEVELOPMENT

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

● *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.*

● *Set Career goals and formulate strategies by Prioritizing, organizing and scheduling the required tasks. Project the appropriate grooming and the right etiquette in the corporate context to excel in professional life.*

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. **(7)**

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 **(7)**

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. **(8)**

GOAL SETTING AND TIME MANAGEMENT

Goal Setting – Immediate, Short Term and Long Term Goals – Smart Goals – Strategies to Achieve Goals - Confidence Building, Self-esteem, Motivation - Time Management –Identifying Time Wasters – Time Management Skills.

(8)

Total: 30 Hours

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.

4.   Simon Sweeney, "English for Business Communication", Cambridge University Press, 2013.

5.   Meenakshi Raman, Sangeeta Sharma, "Technical Communication - Principles and Practice", 3rd edition, Oxford University Press, New Delhi, 2015.

20MSS51 - FULL STACK APPLICATION DEVELOPMENT

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS23

ASSESSMENT : THEORY

COURSE OUTCOMES

CO1 : Design and develop web applications using the front-end javascript framework,
Angular. CO2 : Develop user interfaces for single-page applications using ReactJS.
CO3 : Build a Web Server in Node JS and can explain how it works.
CO4 : Deploy robust web applications with Django framework.
CO5 : Illustrate the different types of attacks against a web application.

FRONT END FRAMEWORK: ANGULAR

Introduction to Angular- Built-in Angular Directives - Angular Components - Template-Driven Forms - Angular Services - Routing in Angular.

(9)

FRONT END FRAMEWORK: REACT JS

Setting up a React Project - JSX - Rendering Elements - Components and Props - State and Lifecycle, Handling Events - Lists and Keys - Forms - Working with APIs - Routing - Hooks. **(10)**

BACK END FRAMEWORK: NODE JS

Setting up for Node.js Development - Node.js - Core Node.js - Node.js Packages - Events and Streams - Starting with HTTP - Introducing Express.

(10)

FULL STACK FRAMEWORK: DJANGO

Introduction to Django - MVT pattern - creating virtual environment - Django project - creating apps - template files - views, adding path - project structure and apps - working with templates - jinja templates - static files - creating models - connecting database - views and urlpatterns - working with forms. **(9)**

WEB APPLICATION SECURITY

Authentication: Authentication fundamentals - Web Application Authentication - Securing Password-Based Authentication. Authorization: Goals - Determining access - Types of permissions Attacks against authorization - Session management- Attacks against sessions - Browser Security Principles- cross-site scripting and request forgery - Database Security Principles-SQL injection.

(7)
TOTAL: 45

TEXT BOOKS

1. *Shyam Seshadri, "Angular Up & Running", O'Reilly, 2018.(Para1)*
2. *Basarat Ali Syed, "Beginning Node.js", Apress, 2018. (Para3)*

3. Samuli Natri, "Django- The Easy Way" Independently Published 2018. (Para4) 4.
Bryan Sullivan, Vincent Liu, "Web Application Security", McGraw Hill, 2012. (Para5)

WEB

1. ReactJS, https://reactjs.org/docs/getting-started.html (Para2)

REFERENCE BOOKS

1. *GoalKicker.com, "Angular 2+: Notes for Professional", 2018.(ebook)*
2. *GoalKicker.com, "Node.js: Notes for Professional", 2018. (ebook)*
3. *GoalKicker.com, "React JS: Notes for Professional", 2018.(ebook)*
4. *Mark Clow, "Angular 5 Projects", Apress. 2018.*
5. *Nigel George, "Mastering Django: Core", Packt Publishing, 2016.*
6. *Robin Weiruch, "The Road to React", Learn Pub, 2020.*

20MSS52 - COMPUTER NETWORKS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : Theory

COURSE OUTCOME

    CO1 : Describe and justify the key protocols that govern the Internet

    CO2 : Distinguish the various approaches used by each layer in offering the intended services

    CO3 : Explain the operation of the basic Internet protocols, and illustrate how they can be used to assist in network design

    CO4 : Describe the current architecture of the Internet and the entities involved in running the Internet

    CO5 : Analyze both qualitatively and quantitatively the performance of network protocols

Introduction
Basics of Internet – Network Edge – Network Core – Delay, Loss and Throughput in Packet switched Networks- Protocol Layers and Model.

(9)

Application Layer
Principles of Network Applications – Web and HTTP – Domain Naming System – Electronic Mail - Peer-to-Peer Application – Socket Programming,

(9)

Transport Layer
Transport Layer Services – Multiplexing and DeMultiplexing – Connectionless Transport : UDP – Principles of Reliable Transfer – Connection Oriented Transport : TCP – Basics of Congestion Control – TCP Congestion Control.

(10)

Network Layer
*Data Plane :*Services – Router Architecture – Internet Protocol: IPv4 – IPv6 – NAT.
Control Place : Routing Algorithms – Intra-AS routing – Routing among the ISPs – Internet

Control Message Protocol – Network Management.

(9)

Link layer
Services - Error Detection and Correction – Multiple Access Links and Protocols – Switched
Local Networks – Data Center Networking – Handling a web page Request.

(8)

TOTAL : 45

TEXT BOOK
1. James F. Kurose , Keith W. Ross, "Computer Networking -A Top-Down Approach", 7th
   Edition, Pearson 2017.

REFERENCE BOOKS

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth
   Edition, Morgan Kaufmann Publishers, 2011.
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.

20MSS53 - DESIGN AND ANALYSIS OF ALGORITHMS

Contact Hours

L	T	P	C
3	1	0	4

PRE-REQUISITES

20MSS22, 20MSS33

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Describe the various algorithm design paradigms and explain when an algorithmic design situation calls for them

CO2 : Explain the algorithms that employ the paradigms

CO3 : Analyze a problem and identify the design paradigm appropriate for its solution. CO4 : Analyze the performance of the algorithmic design paradigm.

CO5: Apply the appropriate data structure and algorithm design technique for a specified application

DIVIDE AND CONQUER

General Method- Binary Search - Finding the Maximum and Minimum- Merge Sort - Quick Sort - Strassen's Matrix Multiplication.

(8)

GREEDY METHOD

General Method - Knapsack Problem - Tree Vertex Splitting - Minimum-cost spanning trees Optimal Merge Patterns - Single Source Shortest Paths.

(8)

DYNAMIC PROGRAMMING

General Method - Multistage Graphs - All-Pairs Shortest Paths - Single Source Shortest Path - String Editing -Traveling Salesperson Problem - Flow Shop Scheduling.

(8)

BACKTRACKING

General Method - 8 Queens Problem – Sum of Subsets- Graph Coloring -Hamiltonian Cycles. BRANCH AND BOUND: General Method - 0/1 Knapsack Problem - Traveling Salesperson Problem.

(14)

NP-HARD, NP-COMPLETE CLASSES

Basic concepts – Non deterministic algorithms – satisfiability problem – NP-hard and NP-complete Problems – Cook's theorem (informal proof).

(7)

TOTAL : 45

TEXT BOOK

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamental of Computer Algorithms", Galgotia Publications, 1998.

REFERENCE BOOK

1. Ellis Horowitz, Sahni& Susan Anderson-Freed, " Fundamentals of Data Structures in C", Universities Press, Second Edition,2007.

<div align="center">**20MSS54 – MACHINE LEARNING**</div>

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS21 , 20MSS32
ASSESSMENT: THEORY
COURSE OUTCOME

>*CO1 : Compare and contrast different paradigms for learning.*
>*CO2 : Describe the key algorithms and theory that form the core of machine learning. CO3 : Choose and apply the learning algorithms that is most appropriate for a given learning task*
>*CO4 : Design experiments to evaluate and compare different machine learning techniques on real-world problems*
>*CO5 : Given a description of a ML technique, analyze it to identify the expressive power of the formalism; the inductive bias implicit in the algorithm; the size and complexity of the search space;*

Introduction
Machine Learning definition – Machine Learning Applications – Designing a Learning Systems – Supervised Learning – Unsupervised Learning – Reinforcement Learning – Perspectives and Issues in Machine Learning.
Concept Learning
A Concept Learning Task – Concept Learning as Search -FIND-S: Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate-Elimination Algorithm – Inductive Bias.

(5+6)

Decision Tree Learning
Decision Tree Representation – Appropriate Problems for Decision Tree Learning – The Basic Decision Tree Learning – Hypothesis Space Search in Decision Tree Learning – Inductive Bias Issues.

(6)

Artificial Neural Networks
Perceptrons – Multilayer Networks and the Backpropagation Algorithm –Inductive Bias and Issues – Case Study on Face Recognition.

(7)

Bayesian Learning

Bayes Theorem – Bayes Theorem and Concept Learning – Maximum Likelihood and Least Squared Error Hypotheses – Maximum Likelihood Hypotheses for Predicting Probabilities – Naïve Bayes Classifier – Bayesian Belief Networks .

(7)

Instance Based Learning

k-Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Function – Case Based Reasoning.

Reinforcement Learning

Learning Task – Q Learning – Nondeterministic Rewards and Actions – Temporal Difference Learning.

(7+7)

Total: 45

TEXT BOOKS

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill International Edition, 1997.(Para 2-7)
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Second Edition, 2014.(Para 1)

REFERENCE BOOKS

1. Stephan Marsland, "Machine Learning - An Algorithmic Perspective", Chapman and Hall, 1st Edition,2009.
2. Nils Nilsson, "Introduction to Machine Learning", MIT Press, 1997.
3. Jude Shavil, Thomas G Dietterich, "Readings in Machine Learning", Morgan Kaufmann Publishers, 1990.

20MSS55 - FULL STACK APPLICATION DEVELOPMENT LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS25

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

    CO1 : Acquire knowledge and skills for creation of web sites considering both client and server side programming.
    CO2 : Develop web applications using the front-end Angular framework.
    CO3 : Develop simple web applications using ReactJS.
    CO4 : Understanding and building a Web Server in Node framework.
    CO5 : Design and develop fully functional web applications using Django.

CONCEPTS TO BE COVERED

- Design web pages using built-in and custom Angular Components, Directives and Filters.

- Design and develop Notes/e-commerce applications using Angular.

- Implement CRUD operations on a basic E-Commerce site using ReactJS.

- Develop Messaging App using ReactJS.

- Add web sign-in to an app using Node.js.

- Implement a TODO manager program using Node.js.

- Connect to a database and perform CRUD operations.

- Develop a fully functional web application (prediction/recommendation systems) using Django.

20MSS56 NETWORK PROGRAMMING LAB

Contact Hours

L	T	P	C
0	0	4	2

PREREQUISITES
Consent of the Instructor

ASSESSMENT: **PRACTICAL**

COURSE OUTCOME

CO1 : Use Socket APIs to develop simple applications
CO2 : Develop and implement distributed applications using Socket API for a given set of requirements.
CO3 : Develop network debug tools.
CO4 : Develop new simple protocols for a given set of requirements.
CO5 : Develop servers for the given requirements.

Tools: Socket API - C and Python

THE STUDENTS MUST BE TRAINED TO DEVELOP

1. TCP and UDP applications by exploiting Socket API - concurrent and iterative server applications
2. Applications making use of the various socket options
3. Debugging and maintenance tools with the help of RAW sockets and SOCK_PACKET
4. Applications using SIGALRM, SO_RCVTTIMEO, non-blocking sockets 5. Applications using I/O multiplexing
6. Clients to interoperate with the well known servers.
7. Emulating the functionality of the well known servers.

20MSS57 - COMMUNICATION SKILLS

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : Conceive appropriate verbal responses from the learners to a given social situation, using the guidelines to effective speaking skills and body language.

CO2 : Generate troubleshooting solutions to develop team building and interpersonal skills with case studies that focus on body language and empathy.

CO3 : 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.

CO4 : Compose appropriate written responses to professional problems faced by a team at the workplace arising out of ineffective communication skills.

CO5 : Generate valid points for and against a HR topic and present them with appropriate group behavior. For any job requirement, plan and prepare for a 20 minute mock interview.

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 – Closing Tips   **(4)**

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.   **(8)**

TELEPHONING SKILLS & NEGOTIATIONS

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 – Fixing 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.   **(8)**

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.   **(3)**

SPEAKING
Job Interviews: Introduction - Types of Interviews – Planning and Preparing for an Interview -Importance of body Language in Interview - Need for proper Articulation - Concluding an Interview - Telephonic or Video Interview - A Mock Interview - Group Discussion: Introduction - Ability to Work as a Team – Communication Skills - Active Listening - Non-verbal Communication - Leadership and Assertiveness - Reasoning – Ability to Influence - Innovation. Creativity, and Lateral Thinking - Flexibility - Key Steps to Succeed in a Group Discussion - The Responsibility of the First Speaker - Concluding the Discussion - Dos and Don'ts during a Group Discussion.   **(7)**

Total : 30

REFERENCE BOOKS

1. Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.
2. Krishna Mohan, Meera Banerji. "Developing Communication Skills" Macmillan Publishers, 2012.
3. Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.
4. Simon Sweeney, "English for Business Communication", Cambridge University Press, 2013.
5. Meenakshi Raman, Sangeeta Sharma, "Technical Communication - Principles and Practice", 3rd edition, Oxford University Press, New Delhi, 2015.

20MSS61 - SOFTWARE TESTING AND QUALITY ASSURANCE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS13 , 20MSS43
ASSESSMENT : THEORY

COURSE OUTCOME

> *CO1 : Analyze different approaches to identify software defects and develop testing plans based on v-model.*
> *CO2 : Describe and distinguish among the different types and levels of testing. CO3 : Design and develop black box and white box testing techniques, test cases, test data and conduct test operation at various testing levels for given testing requirements. CO4 : Apply different approaches of quality management and quality assurance . CO5 : Implement various test processes for quality improvement.*

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 and 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 pará 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.*

20MSS62 - MOBILE COMPUTING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS52

ASSESSMENT: THEORY

Course outcome

CO1 : Explain the basics of wireless communication.
CO2 : Illustrate the operation of the various wireless technologies.
CO3 : Explain the services needed by the layers of the network stack to support mobility. CO4 : Explain the hardware and software components of a mobile phone.
CO5 : Explain how the mobile hardware interacts with the network.

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 -OFDMA. **(9)**

WIRELESS TECHNOLOGIES
GSM : Services - architecture - radio interface - Protocols - Localization - Handover - Security - Data Services.
5G Mobile Networks: Introduction - Radio transmission - Basic Architecture - RAN Internals - Capabilities. **(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)**
SMARTPHONE HARDWARE AND SYSTEM DESIGN

Smartphone processor : Implementation - Memory - Application Processing Unit - Multimedia modules - Connectivity modules. **Software Architecture Design :** Booting Process - Operating System - Speech and Multimedia Application Software - UE protocol Stack. **(9)**

TOTAL : 45

Text Books

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2004.(Para 1,2,4,5) 2. Larry Peterson and Oguz Sunay, "5G Mobile Networks: A Systems Approach", Morgan and Claypool Publishers, 2020. (Para 3)

3. Sajal Kumar Das, "Mobile Terminal Receiver Design LTE and LTE‑Advanced", John Wiley, 2017. (Para 6)

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, 2019.

20MSS63 CLOUD COMPUTING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS34, 20MSS35

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : Explain the core concepts of the cloud computing paradigm

CO2 : Compare the service models offered by different service providers and choose an appropriate platform for implementing cloud computing solutions considering management, security and trust requirements.

CO3 : Analyze various cloud programming models and apply them to solve problems on the cloud.

CO4 : Elucidate the concept, features, use cases, and benefits of containers, and the difference between containers and virtual machines.

CO5: Explain how Fog and Edge Computing Paradigms completes Cloud.

DISTRIBUTED SYSTEM MODELS AND ENABLING TECHNOLOGIES Technologies for Network-Based Systems - System Models for Distributed and Cloud Computing -Software Environments for Distributed Systems and Clouds - Performance, Security, and Energy Efficiency.

(6)

CLUSTERS and VIRTUALIZATION OF CLUSTERS
Clustering for Massive Parallelism - Computer Clusters and MPP Architectures -Design Principles of Computer Cluster. Implementation Levels of Virtualization -Virtualization Structures/Tools and Mechanisms -Virtualization of CPU, Memory, and I/O Devices -Virtual Clusters and Resource Management -Virtualization for Data-Center Automation.

(9)

COMPUTING CLOUDS AND SERVICE-ORIENTED ARCHITECTURE Cloud Platform Architecture: Cloud Computing and Service Models -Data-Center Design and Interconnection Networks - Architectural Design of Compute and Storage Clouds - Public Cloud Platforms:

GAE, AWS, and Azure - Inter-cloud Resource Management - Cloud Security and Trust Management. **Service-Oriented Architecture for Distributed Computing:** Services and Service-oriented Architecture - Message-oriented Middleware - Service Registries - Basic Workflow. **(12)**

CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS

Features of Cloud and Grid Platforms - Parallel and Distributed Programming Paradigms - Programming Support of Google App Engine - Programming on Amazon AWS and Microsoft Azure - Emerging Cloud Software Environments. **(9)**

MICROSERVICE BASED APPLICATIONS and NEW COMPUTING PARADIGMS

Microservices: Introduction - Migrating and Implementing Microservices - Containerization: Docker Container - Container Orchestration - Container Management.

New Computing Paradigms: Introduction - Relevant Technologies - Fog and Edge Computing Completing the Cloud - Advantages of FEC - Hierarchy of Fog and Edge Computing - Business Models - Opportunities and Challenges. **(6+5)**

TOTAL : 45

Textbooks

1. Kai Hwang,Geoffrey C Fox, John J Dongarra, Distributed and Cloud Computing From Parallel Processing to the Internet of Things", Morgan Kaufmann, 2012.(Para 1-4)
2. Parminder Singh Kocher, "Microservices and Containers", Addison Wesley, 2018. (Para 5)
3. Rajkumar Buyya , Satish Narayana Srirama , "Fog and Edge Computing: Principles and Paradigms", Wiley Series, 2019.(Para 6)

Reference Books

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

20MSS64 - SOFTWARE ARCHITECTURE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSS43

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Describe the need for creating the decomposition, process, and allocation architectural views of the software systems

CO2 : Analyze the architecture requirements through understanding quality attributes and tactics

CO3 : Choose the patterns for designing the architecture of the software system based on the architecture modeling tactics

CO4 : Design and Document the architecture of the system using attribute driven technique and UML respectively.

CO5 : Evaluate the correctness of the software system architecture using ATAM method

INTRODUCTION TO SOFTWARE ARCHITECTURE

Software Architecture Definition - Architectural Structures and Views - Architectural Patterns – Software Architecture Importance – Contexts of Software Architecture

(8)

QUALITY ATTRIBUTES

Understanding Quality Attributes – Availability – Interoperability – Modifiability – Performance – Security – Testability – Usability.

(12)

ARCHITECTURAL PATTERNS

Overview of the Pattern Catalog – Relationship between Tactics and Patterns – Using Tactics together – Modeling Architectures to Enable Quality Attribute Analysis.

(8)

ARCHITECTURAL IN THE LIFE CYCLE

Architecture and Requirements – Designing Architecture – Documenting Software Architecture – Architecture, Implementation, and Testing.

(10)

ARCHITECTURE EVALUATION

Evaluation Factors – Architecture Tradeoff Analysis Method(ATAM) – Economic Analysis Basis - Cost Benefit Analysis Method(CBAM)

(7)

Total= 45

Textbook
   1. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", 2nd Edition, Pearson Education, Third Edition, 2013.

Reference Books
   1. Frank Buschmann, RegineMeunier, Hans Rohnex, Peter Sommerland and Michael Stal, "Pattern -Oriented Software Architecture - A Systems of Patterns Volume - I", Reprint 2010.
   2. Mary Shaw and David Garlan, "Software Architecture - Perspectives on an Emerging Discipline",PHI,1996

20MSS65 – SOFTWARE ENGINEERING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
15MSS43

ASSESSMENT : PRACTICAL

COURSE OUTCOME

   CO1 : Develop a plan for appropriate selection of process models for the given scenario.
   CO2 : Create Software Requirements System from the description of user/customer to provide solutions for commercial/scientific problems using open source tools. CO3 : Construct Use Case model, which includes Actors(primary and secondary), Use Cases (Precondition, Post Condition, Successful and Alternative Scenario)to describe the requirements of a given problem using open source tools.
   CO4 : Design the Analysis Class model that consists of classes/objects and their basic attributes, methods and relationships among them by realizing the use cases. CO5 : Produce the design models both static and dynamic for the SRS, use case model and Analysis Class generated and Build prototype of user interface for the systems attempted.

STUDENTS MUST BE TRAINED

   1. Determine the scope of the problem and identify appropriate process models. 2. Create software requirements specification from the communication phase of the life cycle model.
   3. Requirement Analysis and generating use case model - Identifying actors , Identifying use cases, Writing use case description (detailed use case)
   4. Analysis class/object identification and generating analysis model
          a. using noun phrase analysis
   5. Use case realization(using sequence or collaboration diagram for use cases)
          a. Finding attributes
   6. Performing classification(generalization/specialization)
   7. Relating classes/objects (links, association)
          a. Design class model creation
          b. Finding methods
          c. Refining attributes and associations
          d. Generating behavioral model
   8. Build prototype of user interface.

9. Testing - Tools : J Unit, Selenium

JUnit

    a. Introduction ,Unit Testing with JUnit ,Installation of JUnit ,Introduction to
       JUnit API

    b. Test ,TestCase,Assert,TestRunner,TestSuite

    c. JUnit4.x

    d. Static imports with Eclipse ,Annotations,Assert statements

Selenium

Selenium IDE and RC Introduction ,Installing Selenium IDE , "Selenese" –
Selenium Commands ,Actions, Asserts, Assessors.

Developing Test Cases & Test Suites with Selenium-IDE ,Introduction to Selenium RC

20MSS66 – CLOUD and MOBILE APPLICATION DEVELOPMENT LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1 : Build a fully functional store-worthy Android app
CO2 : Design mobile applications that are aware of the resource constraints of mobile devices.
CO3 : Demonstrate knowledge on creating, cloning, migrating virtual machines using VirtualBox, a virtualization tool
CO4 : For a given system configuration, can use EC2 to acquire instances CO5 : Develop applications, launch on Google App Engine, and access it with proper authentication mechanisms

CONCEPTS TO BE COVERED

Cloud Application Development:

I. Virtualization – Virtual Box

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

II. 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

     5 Working with Cloud Container

     6. Deploy a mobile application in the cloud platform

Mobile Application Development:

Tools: Android / React Native / Flutter

    Building a basic UI-driven App

    Creating mobile services

    Applications carrying out data management with SQLite3

    Basic Networking using WebKit

    SMS and GPS implementation

    Image manipulation

    Proximity and Location services (Bluetooth, GoogleMaps)

20MSS81 - SOFTWARE PROJECT MANAGEMENT

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS13 , 20MSS43

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : *Describe the basic project management concepts, framework and the process models and practice in a real time project environment.*

CO2 : *Implement the knowledge about software process models and software effort estimation techniques.*

CO3 : *Determine an appropriate project management approach through an evaluation of the business context and scope of the project.*

CO4 : *Estimate the risks involved in various project activities.*

CO5 : *Learn staff selection process and the issues related to people management*

PROJECT EVALUATION AND PROJECT PLANNING : Importance of Software Project Management – Activities – Methodologies – Categorization of Software Projects – Setting objectives – Management principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

(9)

PROJECT LIFE CYCLE AND EFFORT ESTIMATION : Software process and Process Models – Choice of Process models – Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II – a Parametric Productivity Model.

(8)

ACTIVITY PLANNING AND RISK MANAGEMENT: Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost schedules.

(9)

PROJECT MANAGEMENT AND CONTROL : Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control – Software Configuration Management – Managing contracts – Contract Management. **(9)**

STAFFING IN SOFTWARE PROJECTS : Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Leadership.

(10)

TOTAL : 45 HOURS

*T**EXT BOOK:***

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCE BOOKS:

1. Robert K. Wysocki ―Effective Software Project Management – Wiley Publication, 2011.

2. Walker Royce: ―Software Project Management- Addison-Wesley, 1998. 3. Gopalaswamy Ramesh, ―Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

20MSS82 SMART SENSORS AND INTERNET OF THINGS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS52, 20MSS62

ASSESSMENT : THEORY

COURSE OUTCOME

    CO1 : Differentiate the levels of the IoT stack and explain the key technologies and protocols employed at each layer of the stack

    CO2 : Given an application, assess the different IoT technologies that suits the application

    CO3 : Design simple IoT systems comprising sensors, edge devices, wireless network connections and data analytics capabilities.

    CO4 : Differentiate the prevalent architectures – distributed, centralized, and edge.

    CO5 : Identify analytics/Machine learning techniques to apply on sensor data to define context, find faults, ensure quality, and extract actionable insights.

INTRODUCTION TO IoT

Overview : Genesis of IoT – IoT and Digitization – IoT Impact – High Level view of Practical IoT use cases – Convergence of IT and OT – IoT Challenges. IoT Network Architecture: Drivers behind New Network Architectures – Constrained Devices and Networks – Comparing IoT Architectures – IT and OT responsibilities in the IoT Reference Model – Core IoT Functional Stack – IoT Data Management and Compute Stack.

(9)

END POINTS AND COMMUNICATION

End Points: Sensing Devices – Smart endpoints – Sensor Fusion – Functional Example – Energy Sources. **Non-IP based WPAN**: IEEE802.15.4 – Zigbee – Zigwave. **IP based WPAN:** 6LoWPAN. **Long Range Communication Systems :** Cellular Connectivity – LoRa and

LoRaWAN

(11)

EDGE / CLOUD PROTOCOLS

Routers and Gateways : Routing Functions – Software-Defined Networking. **IoT Edge and Cloud Protocols :** MQTT – MQTT-SN – Constrained Application Protocol. **(8)**

ANALYTICS IN IoT

Constraints of Cloud Architecture for IoT – Fog Computing: OpenFog Reference Architecture -Fog Topologies - Edge computing: Overview – Empowering Edge applications with deep learning – Challenges.

(9)

IoT SECURITY

Anatomy of IoT cyber Attacks - Security Critical Application areas of IoT – Sources of Security Threats in IoT Applications – Improvements and Enhancements required for Upcoming IoT Applications – Solutions - Software Defined Perimeter - IoT Security best practices. **(8)**

Total : 45 Hours

TEXT BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, Cisco Press, 2017.(Para-1)

2. Perry Lea, "Internet of Things for Architects: Architecting IoT Solutions by Implementing Sensors, Communication Infrastructure, Edge Computing, Analytics, and Security" , Packt Publishing, 2018.(Para 2,3)

3. Fangxin Wang, Xiaoqiang Ma, Miao Zhang , Xiangxiang Wang, And Jiangchuan Liu, "Deep Learning for Edge Computing Applications: A State-of-the-Art Survey", IEEE Access, April 2020. (Para 4)

4. VikasHassija , Vinay Chamola , VikasSaxena, Divyansh Jain, Pranav Goyal, And BiplabSikdar, "A Survey on IoT Security: Application Areas, Security Threats, and

Solution Architectures" , IEEE Access, March 2020 (Para-5).

REFERENCE BOOKS

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

2. Z. Shelby, C, "Bormann. 6LoWPAN: The Wireless Embedded Internet", Wiley, 2009.

3. ArsheepBahga, Vijay Madisetti, Internet of Things: A Hands-On Approach Paperback, 2014.

20MSS83 ARTIFICIAL INTELLIGENCE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Describe the basic concepts, methods, techniques, tools, components and functions of intelligent agents.

CO2 : Given a search problem, analyze and formalize the problem, select the appropriate search method, and develop the algorithm for it.

CO3 : Apply AI techniques to real-world problems to develop intelligent systems.

CO4 : Design and implement logical reasoning agents

CO5 : Describe and implement several of the major approaches to classical planning

.

INTRODUCTION

Artificial Intelligence: Introduction - Risks and Benefits - Intelligent Agents: Agents and Environments-The concept of Rationality-The Nature of Environments-The Structure of Agents.

(9)

PROBLEM-SOLVING AGENTS

Solving problems by searching - Sample problems - Searching Algorithms - Uninformed Search Strategies-Informed Search Strategies-Heuristic Functions. Beyond Classical Search: Local search algorithms and optimization problems-Local Search in continuous spaces-Searching with non deterministic actions-Searching with partial observations online search agents and unknown environments.

(12)

ADVERSARIAL SEARCH AGENTS: Games-Optimal Decisions in games-Alpha-Beta Pruning-Imperfect Real-Time Decisions-Stochastic games-Partially Observable Games-State-of-the-art Game Problems.

(6)

LOGICALAGENTS

Knowledge- Based Agents-The Wumpus world-Logic -Propositional Logic - Proposition theorem Proving - Effective propositional model checking-Agents Based on propositional logic. First-Order Logic:-Syntax and Semantics of First-Order Logic-Using First-Order Logic-Knowledge Engineering in First-Order Logic.

(12)

PLANNING AGENTS

Classical Planning-Algorithms for planning - Heuristics for Planning - Hierarchical Planning - Planning and acting in Non deterministic Domains - Analysis of Planning Approaches.

(6)

TOTAL : 45 HOURS

TEXT BOOKS

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCE BOOKS

1. Dan W. Patterson, "Introduction to AI and Expert Systems", Pearson Education, 2007 . 2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", 3rd edition, McGraw Hill, 2017 .

3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 1992.

20MSS84 - INTERNET OF THINGS LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME
> *CO1 : For a given requirement, choose the required sensors and calibrate. CO2 : Devise interface circuit for connecting a chosen sensor to a Microcontroller board. CO3 : Develop software for Microcontroller board to interact with the sensor to meet the requirements*
> *CO4 : Develop software to interact (send/receive data) with Web/Application server located in the Internet*
> *CO5 : Use data analytics tools to analyze the data collected and present the report to the end-user.*

THE STUDENTS MUST BE TRAINED FOR

1. Gaining knowledge on working of smart sensors for IOT applications.

2. Developing applications using Galileo / Arduino board, exploiting all features of the board.

3. Developing an end-to-end IoT project covering - collect, transport, store, analyse and archive phases.

20MSS85 ARTIFICIAL INTELLIGENCE LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOMES

CO1 : Design and implement heuristic search procedures

CO2 : Develop constraint satisfaction problem solution
CO3 : Design and implement solutions for classical Artificial Intelligence problems
CO4 : Design and implement knowledge based system
CO5 : Use the various Artificial Intelligence tools

CONCEPTS TO BE COVERED
1. Implementing state space search algorithms for solving puzzle problems.
   A* Search
   Hill-climbing Search
2. Implementation of MiniMax Search Procedure with alpha beta pruning for finding the solutions of games.
3. Implementation of Constraint Satisfaction Problem for solving Crypt-arithmetic.
4. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain of your choice.
5. Implementation of Unification algorithm by considering Resolution concept
6. Designing a Chatbot application.
7. Solve the classical Water Jug problem.
8. Solve the classical Monkey Banana problem.
9. Solve the classical Blocks World problem.
10. Development of programs for simulation of computer games like: Tic-Tac-Toe, N-queens Problems, traveling salesman problem, Chess, etc
11. Implementation of operation of Vacuum-Cleaning agent using appropriate search algorithm.
12. Create a knowledge base in PROLOG/LISP that consists of facts, rules and

queries in following domains
- a. Medicine
- b. Agriculture
- c. Finance

13. Develop an Expert System for any specialized domain of choice.

MOOCs

1.

https://www.class-central.com/mooc/445/edx-cs188-1x-artificial-intelligence

2. https://www.class-central.com/mooc/7923/nptel-ai-constraint-satisfaction

20MSS91 AGILE METHODS FOR SOFTWARE DEVELOPMENT

Contact Hours

L	T	P	C
3	0	0	3

Prerequisite
20MSS43

ASSESSMENT: THEORY

Course Outcome:

CO1 : Compare various Agile methods and understand disciplined Agile delivery

CO2 : Practically experience team formulation and involve in initial set up for Agile delivery

CO3 : Build consumable and time to market solutions for the given application

CO4 : Collaborate Inception, Construction and Transition phases of Agile models

CO5 : Practice required Agile methodology successfully.

INTRODUCTION TO AGILE AND DISCIPLINED AGILE DELIVERY Toward a
Disciplined Agile Manifesto - Disciplined Agile Values - Disciplined Agile Principles - Lean
Principles- Scrum- Extreme Programming (XP)- Agile Modeling (AM)-Agile Data - Lean
Software Development - The Agile Scaling Model - Disciplined Agile Delivery (DAD) Process
Framework - A Hybrid Process Framework- Goal-Driven Delivery Lifecycle .   **(10)**

INITIATING A DISCIPLINED AGILE DELIVERY PROJECT
Roles, Rights, and Responsibilities - Forming Disciplined Agile Delivery Teams **-** How the
Inception Phase Works -Aligning with the Rest of the Enterprise- -Other Inception Activities
Inception Phase Patterns- Identifying initial scope - Identifying an Initial Technical Strategy -
Forming the Work Environment.   **(8)**

THE CONSTRUCTION PHASE
How the Construction Phase Work - The Typical Rhythm of Construction Iterations -The
Risk-Value Lifecycle - Construction Patterns -Construction Anti-Patterns - Initiating a
Construction Iteration - Iteration Planning -Visualizing Your Plan-Look-Ahead Planning and
Modeling   **(9)**

BUILD CONSUMABLE SOLUTION
Planning Your Team's Work for the Day -Collaboratively Building a Consumable Solution
-Ongoing Activities Throughout the Day - A Closer Look at Critical Agile Practices - stabilizing
the Day's Work- Demonstrate the Solution to Key Stakeholders - Learn from Your Experiences.
                                                                        (9)

RELEASING THE SOLUTION

Transition phase - How the Transition Phase Works -Planning the Transition Phase -Ensuring Your Production Readiness - Preparing Your Stakeholders for the Release - Deploying the Solution -Transition Phase Patterns – case study. **(9)**

Text Book

1. S.W.Ambler, M.Lines,, "Disciplined Agile Delivery A Practitioner's Guide to Agile Software Development in The Enterprise", IBM Press, First Edition 2012.

Reference Books

1. Robert Martin, "Agile Software Development , Principles,patterns and Practices", Pearson New International Edition , 2013.
2. Andrew Stellman, Jennifer Greene, "Learning Agile : Understanding SCRUM,XP,Lean and Kanban" , O Reilly , 2015.

20MSS92 - INFORMATION SECURITY

PRE- REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOMES

CO1 : Describe the fundamental aspects of Information Security for Web, Networked world, Systems and Communication channels

CO2: Explain the fundamental security design principles.

CO3 : Analyze and understand when and where to use the symmetric and asymmetric algorithms to preserve confidentiality, integrity and authenticity of information

CO4 : Analyze and apply the adequate authentication required for data and users and preserve authentication of resources and users across networks

CO5 : Understand various threats and design new cryptography and network security solutions for enterprises including Government, Industry, Academia and Society

SECURITY ENGINEERING: Concepts - Threat, Attacks, and Assets - Security functional requirements - Security Design principles - Attack surfaces - Attack trees - Security Strategy. Cryptographic tools: Confidentiality with Symmetric Encryption - Message Authentication and Hashing - Public-key Encryption - Digital signature and Key Management - Applications **(9)**

IDENTITY and ACCESS MANAGEMENT
User Authentication: Principles - Authentication Methods - Remote User Authentication methods - Security Issues for User Authentication - Case Study.**Access Control:** Principles - Elements of Access Control - Access control methods - Trust framework. **Intrusion Detection:** Intruders - Intrusion detection - Analysis approaches - Host-based and Network-based Intrusion detection - Distributed Intrusion Detection - Honey pots - Case study.**Firewalls and Intrusion Prevention Systems:** Need - Characteristics and Access Policy - Types - Firewall basing - Configuration - Prevention System.   **(10)**

ASSET SECURITY
Database and Data center security: Need for database security - SQL injection attacks - Database

Access Control - Inference - Database Encryption - Datacenter Security.
Physical and Infrastructure Security: Physical Security Threats - Prevention and Mitigation Measures - Recovery from physical security Breaches - Integration of Physical and Logical Security. **(9)**

MANAGEMENT ISSUES

IT Security and Risk Management : IT Security Management - Organizational Context and Security Policy - Security Risk Assessment - Security Risk Analysis.
IT Security Controls, Plans and Procedures: IT Security Management Implementation - Security Controls - Implementation - Monitoring Risks.
Legal and Ethical Aspects: Cyber crime - Intellectual Property - Privacy - Ethical Issues. **(9)**

CRYPTOGRAPHIC ALGORITHMS

Symmetric Encryption: Principles - Data Encryption Standard - Advanced Encryption Standard - Stream Ciphers - Block Cipher - Key Distribution
Public Key Cryptography: Secure Hash Functions - HMAC - Authentication Encryption - RSA Public Key Encryption algorithm - Asymmetric Algorithms . **(8)**

TOTAL: 45

TEXT BOOKS

1. *William Stallings and Lawrie Brown, " Computer Security: Principles and Practice" , 4th Edition, Pearson, 2018.*

REFERENCE BOOKS

1. *Atul Kahate, "Cryptography and Network Security", Third Edition, McGraw Hill Education, 2013.*
2. *Charles P. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Fourth Edition, Pearson Education, 2007.*
3. *William Stallings, "Cryptography and Network Security: Principles and Practices", Seventh Edition, Pearson Education Ltd, 2017.*

20MSS93 PROFESSIONAL ETHICS

PRE- REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COUR*SE OUTCOME*

CO1 : The students develop an appropriate mindset to create harmony in professional and personal life.

CO2 : Describe major ethical theories including act utilitarianism, rule utilitarianism, Kantian ethics, and social contract theory.
CO3 : Explain and discuss contemporary legal and social issues related to intellectual property, Privacy and information technology.
CO4 : Explain and discuss contemporary legal and social issues related to the effect of information technology on globalization and vice versa.
CO5 : Use ethical reasoning in making informed and principled choices.

Variety of Moral Issues
Understanding the Harmony in Society & Nature, Natural Acceptance of Human Values.
Integrity, Work Ethic, Courage, Empathy, Self Confidence, Moral Autonomy, Consensus and Controversy, Professional and Professionalism, Professional Ideas and Virtues.   **(9)**

Principles of Ethics and Morality
Introduction to Ethical Theories: Kantianism, Utilitarianism & Social Contract Theory
Ethics as a Subset of Morality, Ethics and Organizations, Employee Duties and Rights,
Discriminatory and Pre-judicial Employee Practices   **(9)**

Professional Ethics in Information Technology
Technology and Education Ethics: Cheating – Plagiarism and Information Technology.
Networking Ethics: The internet – Spam and Censorship.   **(9)**

Ethical Issues in Information Age
Intellectual Property: Copyrights, Patents, Trademarks & Trade Secrets – Fair use and Peer to Peer issues.
Open Source Software: GPI, Linux and Creative Commons
Computer Crime and Computer Security, Computer Hacking and Creation of Viruses
Case Study Discussions relevant to the topics.   **(9)**

Computers & Society
Social implications of Artificial Intelligence & Expert Systems – Invasion of privacy in

the workplace and on the internet. Whistle Blowing.
Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics -
Sample Code of Conduct & ACM Code of ethics.   **(9)**
                                                                        Total: 45

REFERENCES BOOKS

1. *Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.*
2. *Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An IndianPerspective", Biztantra, New Delhi, 2004.*
3. *David Ermann and Michele S Shauf, "Computers, Ethics and Society", OxfordUniversity Press, 2003.*
4. *Michael J. Quinn , "Ethics for the Information Age", 6th Edition, Pearsons, 2014. 5. D. Johnson and H. Nissenbaum (eds), Computers, Ethics, and Social Values. Englewood Cliffs: Prentice Hall, 1995.*

WEB

1. *Misha Glenny TED Talk: Hire the Hackers*
2. *Keren Elazari TED Talk: Hackers: The Internet's Immune System*
3. *https://harvardmagazine.com/2000/01/code-is-law-html*

20MSS94 - INFORMATION SECURITY LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOMES

> *CO1 : Construct symmetric and asymmetric algorithms to preserve confidentiality, integrity and authenticity of information*
> *CO2 : Demonstrate the working of various network security tools*
> *CO3 : Implement Visual cryptography, Steganography under various media including text, images and audio*
> *CO4 : Devise defensive measures for securing information resources on current domains*

1. Implementing Substitution and Transposition cipher.

2. Implementing DES, BLOWFISH, AES algorithms

3. Implementing RSA, Key exchange algorithm, ECC algorithm.

4. Implementing SHA, MD5, DSA algorithms.

5. Learning to install and work with Packet capturing tool Wireshark.

6. Learning to install and work with Port scanning tool Nmap.

7. Learning to install and work with MAC Spoofing tool Smac.

8. Learning to install and work with Disk encryption software VeraCrypt. 9.

Implementing Visual Cryptography techniques, Steganography techniques. 10.

Implementing Privacy Preserving techniques.

11. Setting up Valhalla honeypot

12. Setting up Snort - Network intrusion and prevention system

13. Setting up N stalker - web application security scanner

14. Setting up NetStumbler

20MSSE01 - SOA AND WEB SERVICES

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS45, 20MSS64, 20MSSE19

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : Examine the requirements of distributed applications and design web services
CO2: Apply the concepts of Service Oriented Architecture in designing platform independent real time distributed applications
CO3 : Design and develop simple web services that meet the specified requirements
CO4 : Develop web services based on requirements of the web application using Java APIs and also consume them in web applications
CO5 : 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 InterRelationships - 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.

(10)

WEB SERVICES IN JAVA
Introduction to Web Services-Types of Web Services- Deciding which Type of Web Services to use. Building Web Services with JAX-WS - Creating a simple Web Service and clients with

JAX-WS- Types Supported by JAX-WS. Web Services Interoperability and JAX-WS. Building RESTFUL Web Services with JAX-WS.

(10)
Total : 45Hrs

TEXT BOOKS

1. *Thomas Eri, "Service-Oriented Architecture- Concepts, Technology and Design", Pearson Education, Second Edition, 2008. (Para 1 - 4)*
2. *Eric Jendrock, Ricardo Cervera-Navarro, Ian Evans, DevikaGollapudi, Kim Haase, William Markito and Chinmayee Srivathsa, "The Java EE7 Tutorial", Oracle Corporation Press, 2014 (Para 5)*

REFERENCE BOOKS

1. *Eric Jendrock, Jennifer Ball, Debbie Carson, Ian Evans and Kim Haase, "The Java EE5 Tutorial", Oracle Corporation Press, 2010.*
2. *Martin Kalin,"Java Web Services: Up and Running", O'Reily Media Inc., First Edition, 2009.*

20MSSE02 - DISTRIBUTED COMPUTING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS34, 20MSS42, 20MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : Describe the hardware and software concepts needed for distributed system model

CO2 : Compare Remote Procedure Call and Remote Method Invocation from the perspective of developing distributed applications

CO3 : Describe the role of the components of distributed Operating System

CO4 : 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

Total 45 Hours

TEXT BOOKS

1. *Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems - Principles and Paradigms", Prentice Hall of India, 3rd edition 2017. Para(1,3,4,5)*
2. *Cay S.Horstmann, Gary Cornell, "Core Java - Volume II - Advanced Features", Eighth Edition, Prentice Hall, 2008. Para (2)*

20MSSE03- PARALLEL COMPUTING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS34

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.

CO2 : Ability to evaluate the strengths and weaknesses of parallel programming models and how they can be used to facilitate the programming of concurrent systems.

CO3 : Given a parallel algorithm, an input to it, and the number of processors, show the steps performed by that algorithm on that input.

CO4 : Given a problem, will be able to apply the basic algorithmic techniques and design algorithms in a shared memory

CO5 : Given a parallel algorithm, develop message-passing parallel programs with MPI

PARALLEL COMPUTING
Parallel Computing- Need Ever-Increasing Performance - Building Parallel Systems -Need to Write Parallel Programs –Approaches for Writing Parallel Programs.

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.

(4+5)

PRINCIPLES OF PARALLEL ALGORITHM DESIGN
Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Model.

(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 operation.

(9)

TOTAL : 45

TEXT BOOKS

1. 1. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Pearson Education, 2012. (Para 2-6)
2. 2. Peter S Pacheco," An Introduction to Parallel Programming", Morgan Kaufmann,2011.(para 1)

REFERENCE BOOKS

1. M.J. Quinn, "Parallel Programming in C with MPI and OpenMP", McGraw-Hill, 1st Edition, 2003.
2. Blaise Barney, "Introduction to Parallel Computing", Lawrence Livermore National Laboratory, ebook 2010.

20MSSE04 BLOCKCHAIN TECHNOLOGIES

Contact Hours

L	T	P	C
3	0	0	3

PREREQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

CO1 : Explain the basic components of a blockchain, its operations, underlying algorithms, and essentials of trust.

CO2 : Explain the working of Bitcoin and Ethereum blockchains.

CO3 : Explain the role of cryptography in securing blockchain.

CO4 : Apply the learning of solidity and develop smart contracts

CO5 : Develop decentralized apps on Ethereum.

INTRODUCTION
Basics of Distributed Computing - Consensus Mechanisms - Decentralization - Applications of Blockchain - Scalability and Challenges.

(7)

BITCOIN BLOCKCHAIN
Introduction - working of bitcoin - Reference Implementation - Keys and Addresses - Wallets.

(10)

BITCOIN BLOCKCHAIN MINING
Transactions - Scripting - Bitcoin Network - Mining and Consensus.

(9)

ETHEREUM BLOCKCHAIN
Basics - Ethereum Clients - Ethereum Networks - Ethereum Addresses - Wallets - Transactions - Smart Contract Security.

(9)

SMART CONTRACTS
Basics - Life Cycle of a Smart Contract - Building a Smart Contract with Solidity - programming with Solidity - Gas Considerations.

TOTAL : 45

TEXT BOOKS

1. *Imran Bashir, "Mastering Blockchain", Packt Publishing, First Edition, 2017. (Para 1).*
2. *Andreas M. Antonopoulos, "Mastering Bitcoin - Programming the open Blockchain", O'Reilly, 2017.(Para 2,3).*
3. *Andreas M. Antonopoulos Dr. Gavin Wood, "Mastering Ethereum - Building Smart Contracts and DApp", O'Reilly, 2019. Para(4,5).*

REFERENCE BOOKS

1. *Saifedean Ammous, "The Bitcoin Standard: The Decentralized Alternative to Central Banking", Wiley, 2018.*
2. *Lorne Lantz, Daniel Cawrey, "Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, O'Reilly, 2020.*
3. *Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies", Princeton University Press, 2016.*

20MSSE05 - BIG DATA ARCHITECTURE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Describe the architectural issues present when building big data systems
CO2: Explain the architecture of Big Data tools and platforms
CO3: Demonstrate skills in working with Big Data platform to manage large data sets
CO4: Apply Big Data technologies in developing applications to solve common problems.
CO5: Explain how high-level data processing tools Pig, Hive, and Spark work with Hadoop

INTRODUCTION
Understanding Big Data – Capturing Big Data – Benefiting from Big Data – Management of Big Data – Organizing Big Data – Analyzing Big Data – Technology challenges for Big Data – Big Data sources and applications – Distributed Computing using Hadoop.

Types of digital data – Introduction to Big Data – Characteristics – Big Data technology landscape: NoSQL – Hadoop.

Creating the Foundation of a Long-Term Big Data Architecture -Early Big Data with NoSQL.

(10)

THE HADOOP ECOSYSTEM
Big Data and the Hadoop ecosystem- The Hadoop Ecosystem - Hadoop Core Components - Hadoop Distributions - Developing Enterprise Applications with Hadoop.

STORING DATA IN HADOOP - HDFS -HBase -Combining HDFS and HBase for Effective Data Storage -Using Apache Avro - Managing Metadata with HCatalog - Choosing an Appropriate Hadoop Data Organization.

(9)

BIG DATA PROGRAMMING LANGUAGES

Parallel processing with MapReduce: Introduction – MapReduce overview – Sample MapReduce application – MapReduce programming – MapReduce jobs execution - Data Ingest with Kafka – Apache Pig.

(8)

HIVE

Introduction – Getting started – Data types and file formats – HiveQL: Data definition and data manipulation – HiveQL: Queries and views.

(9)

STREAMING ARCHITECTURE

Introduction to Apache Spark - Spark fundamentals – Writing Spark applications – The Spark API in depth – Sparkling queries with Spark SQL – Ingesting data with Spark streaming.

(9)

Total : 45 Hours

TEXT BOOKS

1. Anil Maheswari, "Big Data", 2nd Edition, McGraw-Hill Publications, 2019 (Para 1 & 6).
2. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", 2nd Edition, Wiley Publications, 2020 (Para 2).
3. Bahaaldine Azarmi. "Scalable Big DataArchitecture -A Practitioner's Guide to ChoosingRelevant Big Data Architecture" A Press, 2016 (Para 3).
4. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1st Edition, Wrox Publications, 2013 (Para 4 & 5).
5. Edward Capriolo, Dean Wampler, Jason Rutherglen, "Programming Hive: Data Warehouse and Query Language for Hadoop", 1st Edition, O'Reilly Media, 2012 (Para 7).
6. Peter Zecevic, Marko Bonaci, "Spark in Action", DreamTech Press, 2018 (Para 8).

20MSSE06- INFORMATION RETRIEVAL

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOMES

CO1: Explain basic concepts and techniques in Information Retrieval
CO2: Apply the information retrieval models.
CO3: Evaluate an information retrieval system based on the relevance of the documents it retrieves.
CO4: Compare the relative performances of different systems on benchmark document collections and queries
CO5: Elucidate the issues involved in providing an IR service on a web scale

Introduction : Information Retrieval - Information Retrieval system - Electronic text formats - Open source IR systems. **Boolean Retrieval Model:** Information Retrieval problem - vocabulary and postings lists - Dictionaries and tolerant retrieval - Index construction - Index compression.

(9)

Ranked Retrieval Models: Methods for Scoring Documents - weighting the importance of a term in a Document - Vector space Model for scoring. **Computing scores**: Efficient scoring and Ranking - Components of an IR System - Vector Space scoring and Query operator interaction.
Evaluation in information retrieval: Standard test collections - Evaluation of unranked retrieval sets - Evaluation of ranked retrieval results - Assessing relevance - System quality and user utility.

(9)

Enhancing the Retrieval: Relevance Feedback and pseudo relevance feedback - Global methods for query reformation. **Probabilistic Information Retrieval**: The Probability Ranking Principle - The Binary Independence Model - An appraisal and some extensions. **Language Models for Information Retrieval**: Language Models - The query likelihood model - Comparison of Language Modeling with other approaches.

(9)

Machine Learning Techniques in Information Retrieval: Text Classification and Naive Bayes - Vector Space Classification - SVM and ML on Documents.

Structured Data Retrieval: XML Concepts - Challenges - A Vector Space Model - Evaluation - Text centric and data-centric XML retrieval.**Web Search :** Basics - Web crawling and indexes - Link analysis.

(9)

TEXTBOOKS

1. *John Davies, Information Retrieval: Searching in the 21st Century, Wiley,2009.(Para-1)*
2. *Introduction to Information Retrieval by C. Manning, P. Raghavan, and H. Schütze. Cambridge University Press, 2009.(Para 2-5)*

REFERENCE BOOKS

1. *Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormac, Information Retrieval - Implementing and Evaluating Search Engines,The MIT Press,2016.*
2. *Ricardo Baeza-Yate, Berthier Ribeiro-Neto, "Modern Information Retrieval", Second Edition, ACM Press Books, 2011.*

20MSSE07- ADVANCED DATABASE MANAGEMENT SYSTEMS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS44

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Outline the influence of Database Systems on the centralized, Client/Server and Parallel and Distributed Computer System Architecture.

CO2: Analyze the issues of database design, transaction management, query evaluation and optimization in the context of distributed databases, heterogeneous databases and cloud based databases.

CO3: Construct Object based database, object relational database, spatial and temporal database

CO4: *Use XML in exchange and storage of complex data, Demonstrate the concepts of Spatial and Temporal databases.*

CO5: Implement the concepts and techniques of NoSQL, MongoDB and Map-reduce in real world applications.

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, Intra Query 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. **(13)**

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, Object-Relational Mapping, Object-Oriented versus Object-Relational. **(10)**

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

(7)

NoSQL: Introduction to NoSQL, Aggregate Data Models, More Details on Data Models, Distribution Models, Consistency, Version Stamps, Map-Reduce, MongoDB Data Modeling for applications. **Implementation :** Key-Value Databases, Document Databases – Map-Reduce, MonDB applications.

(10)

TOTAL : 45

TEXT BOOKS

1. *Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", Sixth Edition, McGraw Hill, 2010. Para(1-4)*

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.(Para 5)*

3. *Brad Dayley, "Sams Teach Yourself NoSQL with MongoDB in 24 Hours", Pearson Education, 2015(Para 5)*

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..*

20MSSE08 – PREDICTIVE ANALYTICS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS12, 20MSS21, 20MSS32

ASSESSMENT : THEORY

COURSE OUTCOME
CO1: Describe the forecasting, discrimination, classification, shrinkage and clustering techniques.

CO2: Classify objects into different groups using discriminant function, logistic regression equation and cluster analysis techniques and analyze time series data for forecasting.

CO3: Apply principal component and factor analysis techniques for dimensionality reduction.

CO4: Estimation of time series forecasting, logistic regression, principal component analysis, factor analysis and k-means techniques.

Time Series Forecasting : Introduction to Forecasting-Time Series Data and Components of Time-Series Data – Forecasting Techniques and Forecasting Accuracy-Moving Average Method-Single Exponential Smoothing(ES) – Double Exponential Smoothing-Holt's Method-Regressive Model for Forecasting -Auto-Regressive(AR) Models - Moving Average Process MA(q)) – Auto-Regressive Moving Average (ARMA) Process-Auto-Regressive Integrated Moving Average (ARIMA) Process -Power of Forecasting: Theil's Coefficient.   (12)

Discrimination: Discriminant Function Analysis- Fisher's discriminant function -Fitting discriminant functions.   (6)

Classification: Logistic Regression: Binary Logistic Regression – Estimation of Parameters in Logistic Regression – Interpretation of Logistic Regression Parameters – Logistic Regression Model Diagnostics – Classification Table, Sensitivity and Specificity – Optimal Cut-off Probability – Variable Selection in Logistic Regression – Application of Logistic Regression in Credit Rating.   (8)

Principal Component Analysis and Factor Analysis: Data Reduction Techniques-Definition of Population Principal Components -Principal Components obtained by Standardized variables -Rules to retain number of Principal Components using Scree Plot. **Factor Analysis :** -Definitions-The Orthogonal Factor Model-Its Covariance Structure- Factor Loadings and Interpretations.Exploratory and Confirmatory Factor Analysis- Estimation of PCA and FA.
                                                                       (10)

Clustering: Introduction- Distance and Dissimilarity Measures used in Clustering- Quality and Optimal Number of Clusters-K-Means Clustering and Hierarchical Clustering Methods.   (9)

                                                                           Total: 45

TEXT BOOKS

1. *Dinesh Kumar U, " Business Analytics", Wiley, First Edition, 2017 (Para 1, Para3, Para 5)*
2. *Richard A.Johnsonand Dean W.Wichern, " Applied Multivariate Statistical Analysis", 6th Edition, Pearson Prentice Hall, 2007 (Para 2 and Para 4)*

REFERENCE BOOKS

1. *Joseph F. Hair Jr., William C. Black, Barry J.Babin and Rolph E.Anderson, "Multivariate Data Analysis", 7th Edition, Pearson, 2010.*
2. *G.James,D.Witten, T.Hastie and R.Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2015.*

20MSSE09 - DATA MINING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS44

ASSESSMENT : THEORY

COURSE OUTCOMES
CO1: *Demonstrate the need for data preprocessing and suggest appropriate methods to produce proper data sources for mining.*

CO2: *Construct a data warehouse using different modeling techniques and perform OLAP operations on it.*

CO3: *Analyze the suitability of design techniques to find mining solutions with efficient time, cost and memory requirements.*

CO4: *Construct a legitimate mining solution with the help of design technique guidelines for outlier detection and validate the suitability of the techniques applied.*

CO5: *Devise efficient mining methodologies to mine special types of data for various real-time applications.*

INTRODUCTION
Need – Definition 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. (14)

DATA WAREHOUSING
Data Warehouse: Basic concepts – Modeling – Data cube and OLAP – Design and usage – Implementation. **(7)**

DATA MINING TECHNIQUES
Mining Frequent Patterns and Associations : Basic concepts - Frequent itemset mining methods. **Classification:** Basic concepts - Decision tree induction - Bayes classification method, Rule-based classification.**Cluster Analysis :** Basic concepts and methods - partitioning methods - hierarchical methods: Agglomerative and divisive hierarchical clustering. (12)

OUTLIER DETECTION
Definition – Types – Challenges – Outlier detection methods. (6)

DATA MINING TRENDS

Mining Sequence data – Mining Other kinds of data – Visual and Audio data mining. (6)

TOTAL : 45 Hours

TEXT BOOK

1. *Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition, Elsevier Publications, 2012.*

REFERENCE BOOK

1. *Arun K Pujari, " Data Mining Techniques", Universities Press, 2001.*

20MSSE10 COMPUTER VISION

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS12

ASSESSMENT: THEORY

COURSE OUTCOMES

CO1: Implement fundamental image processing techniques required for computer vision

CO2: Apply 3D reconstruction techniques

CO3: Implement motion related techniques

INTRODUCTION, IMAGE FORMATION AND FILTERING

Computer vision Fundamentals, Photometric image formation, The digital camera, Point operators, Linear filtering, neighborhood 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. **(9)**

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.

(9)

3D RECONSTRUCTION

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

(9)

RECOGNITION

Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

(9)

Total Hours: 45

TEXT BOOK

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

REFERENCE BOOKS
1. *Adrian Kaehler and Gary Bradski, "Learning OpenCV 3", OReilly, 2009*
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.*

20MSSE11 - NATURAL LANGUAGE PROCESSING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS31, 20MSS83

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Describe the fundamental concepts and techniques of natural language processing.

CO2:.Apply Naïve Bayes Classifiers to Classify the Text documents.

CO3:Apply logistic regression model for classification.

CO4: Evaluate approaches to syntax and semantic processing in NLP and apply Hidden Markov Model for Word Processing and Speech Recognition..

CO5: Apply neural language models in the process of language modeling and apply deep learning architectures for Sequence Processing

CO6: Design, implement and test algorithms for NLP problems.

INTRODUCTION
Knowledge in Speech and Language processing - Ambiguity - Models and Algorithms - **REGULAR EXPRESSIONS, TEXT NORMALIZATION AND EDIT DISTANCE**: Introduction - Regular Expressions-words – Corpora – Text Normalization – Minimum edit distance.
N GRAM LANGUAGE MODELS: Ngrams - Evaluating Language Models- Sampling sentences from a language model- Generalization and Zeros- Smoothing- Kneser-Ney Smoothing- Huge Language Models and Stupid Backoff-Perplexity's Relation to Entropy.

(9)

NAIVE BAYES AND SENTIMENT CLASSIFICATION: Naive Bayes Classifiers - Training the Naive Bayes Classifier-Worked example-Optimizing for Sentiment Analysis - Naive Bayes for other text classification tasks-Naive Bayes as a Language Model - Evaluation: Precision, Recall, F-measure - Test sets and Cross-validation - Statistical Significance Testing - Avoiding Harms in Classification
LOGISTIC REGRESSION: The sigmoid function - Classification with Logistic Regression-Multinomial logistic regression-Learning in Logistic Regression-The cross-entropy

loss function-Gradient Descent-Regularization-Learning in Multinomial Logistic Regression-Interpreting models (9)

VECTOR SEMANTICS AND EMBEDDINGS: Lexical Semantics - Vector Semantics - Words and Vectors - Cosine for measuring similarity - TF-IDF: Weighing terms in the vector - Pointwise Mutual Information (PMI) - Applications of the TF-IDF or PPMI vector models - Word2vec - Visualizing Embeddings - Semantic properties of embeddings - Bias and Embeddings - Evaluating Vector Models

SEQUENCE LABELING FOR PARTS OF SPEECH AND NAMED ENTITIES: (Mostly) English Word Classes - Part-of-Speech Tagging - Named Entities and Named Entity Tagging - HMM Part-of-Speech Tagging - Conditional Random Fields (CRFs) - Evaluation of Named Entity Recognition. (9)

NEURAL NETWORKS AND NEURAL LANGUAGE: Overview of Feedforward Neural Networks - Feedforward networks for NLP: Classification-Feedforward Neural Language Modeling-Training Neural Nets-Training the neural language model

DEEP LEARNING ARCHITECTURES FOR SEQUENCE PROCESSING: Overview of Language Models -Recurrent Neural Networks-RNNs as Language Models-RNNs for other NLP tasks-Stacked and Bidirectional RNN architectures
(9)
APPLICATIONS : Machine Translation and Encoder-Decoder Models - Information Extraction - Question Answering - Chatbots & Dialogue System - Automatic Speech Recognition and Text-to-Speech (9)

TOTAL : 45 Hours

 TEXT BOOK

1. *Daniel Jurafsky and James H Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice-Hall, Upper Saddle River, NJ, 2000. Para(1 - 5)*

REFERENCE BOOKS
1. *James Allen,"Natural language Understanding", Pearson Education, Second Edition, 1994.*
2. *Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, O_Reilly Media, 2009.*
3. *Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.*
4. *Manning, Christopher D. and Hinrich Schutze, "Foundations of Statistical Natural Language Processing", Cambridge, MA: MIT Press. Para 5*

20MSSE12 META-HEURISTIC LEARNING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME

CO1: Explain the strengths, weaknesses, and appropriateness of nature-inspired algorithms.

CO2: Apply genetic algorithms and ant-colony optimization to solve engineering optimization problems

CO3: Evaluate performance of nature inspired algorithms in the context of problem solving in an optimized manner.

CO4: Create a real effective artificial immune system with the use of properties exhibited from nature

CO5: Apply nature-inspired algorithms to optimization, design and learning problems.

INTRODUCTION: From Nature-to-Nature Computing - Three Branches- Models and Metaphors -Individuals- Entities -Agents - Parallelism and Distributivity - Interactivity -Adaptation- Feedback-Self-Organization-Complexity-Emergence-Reductionism. Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

(8)

EVOLUTIONARY COMPUTING: Hill Climbing and Simulated Annealing- Darwin's Dangerous Idea-Genetics Principles- Standard Evolutionary Algorithm -Genetic Algorithms, Reproduction-Crossover-Mutation- Evolutionary Programming- Genetic Programming.

(8)

SWARM INTELLIGENCE: Ant Colonies- Ant Foraging Behavior- Ant Colony Optimization- S-ACO -Scope of ACO algorithms- Ant Colony Algorithm (ACA)- Swarm Robotics- Foraging for food- Social Adaptation of Knowledge-Particle Swarm Optimization (PSO).

(9)

IMMUNO COMPUTING: Immune System- Main components- Pattern Recognition and Binding- Immune Network Theory- Danger Theory- Evaluation Interaction-Immune Algorithms-Bone Marrow Models -Forest's Algorithm -Artificial Immune Networks.

(10)

HYBRID FUZZY SYSTEMS: Fuzzy Systems - Fuzzy Set Theory - Fuzzy Logic and Inference - Integration of Neural Networks Fuzzy Set Theories and Evolutionary Algorithms- Fuzzy- Back propagation Networks: LR-type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP - Inference by Fuzzy BP – Applications.

(10)

TOTAL: 45

TEXTBOOKS

1. *Leandro Nunes de Castro, "Fundamentals of Natural Computing: Basic concepts, Algorithms and Applications ", Chapman & Hall/CRC, Taylor and Francis Group, 2007. (Para 1,3,4,5)*
2. *S. Rajasekhara, G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms Synthesis and Applications", PHI Learning Pvt., Ltd, Second Edition,2017. (Para 2)*

REFERENCES

1. *Andries P. Engelbrecht, Computational intelligence: an introduction, edition 2, John Wiley and Sons, 2007.*
2. *Amit Konar, "Computational Intelligence Principles, Techniques and Applications", Springer International Edition,2005.*

20MSSE13 - DEEP LEARNING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS12, 20MSS21,20MSS32

ASSESSMENT: THEORY

COURSE OUTCOME

CO1: Describe the need of deep learning, concepts and methods of deep forward networks, convolutional networks, recurrent networks and autoencoders.
CO2: Compare the features and needs of the deep learning techniques.
CO3: Apply the deep learning techniques for designing computer vision and speech recognition applications
CO4: Analyze and choose the appropriate techniques for the given problem

MACHINE LEARNING BASICS: Learning algorithms- Capacity, Overfitting and Underfitting – Hyperparameters and Validation Sets – Estimators, Bias and Variance – Maximum Likelihood Estimation – Bayesian Statistics – Supervised Learning Algorithms – Unsupervised Learning Algorithms – Stochastic Gradient Descent- Challenges Motivating Deep Learning. (8)

DEEP FORWARDS NETWORKS: Learning XOR – Gradient-Based Learning – Hidden Units – Architectural Design – Back-Propagation – Computational Graph. (8)

REGULARIZATION FOR DEEP LEARNING: Parameter Norm Penalties – Norm Penalties as Constrained Optimization – Regularization and Under-Constrained Problems- Dataset Augmentation – Noise Robustness – Semi-Supervised Learning – Multi-Task Learning – Early Stopping. **Autoencoder:** Undercomplete Autoencoder – Regularized Autoencoder – Representational Power, Layer Size and Depth – Stochastic Encoders and Decoders – Denoising Autoencoder – Contractive Autoencoder - Applications. (10)

CONVOLUTIONAL NETWORKS: The Convolution Operation – Motivation – Pooling – Convolution and Pooling – Variants of Basic Convolution Function – Structured Outputs – Data Types – Efficient Convolution Algorithm – Random or Unsupervised Features.

RECURRENT AND RECURSIVE NETS: Unfolding Computational Graphs – Recurrent Neural Networks (RNNs) – Bidirectional RNNs – Encoder-Decoder Sequence-to-Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – Long-Term Dependency Challenges – Long Short-Term Memory and Gated RNNs; Practical Methodology; Applications . (12)

TOTAL: 45

TEXT BOOK

1. *Ian Goodfellow, Yousha Bengio and Aaron Courville, " Deep Learning", MIT Press, 2016.*

REFERENCE BOOKS

1. *Francois Chollet, "Deep Learning with Python", Manning Publications, 2018*
2. *Li Deng and Dong Yu, " Deep Learning Methods and Applications", Now Publisher, 2013.*

20MSSE14 DECISION SUPPORT SYSTEMS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS21, 20MSS32, 20MSS54, 20MSS83, 20MSSE13

ASSESSMENT:THEORY

COURSE OUTCOME

CO1: Integrate analytics, data science, and business intelligence to build modern decision support systems.
CO2: Apply the latest technologies like deep learning, cognitive computing, World Wide Web, cloud computing to develop decision support systems.
CO3: Build advanced knowledge-based decision support systems knowledge acquisition and representation, inference techniques, and intelligent systems development.
CO4: Choose appropriate computerized decision-making tools to develop data-driven optimized enterprise decision support systems for the given business problem.
CO5: Identify ethical, political, and the organizational and societal implications of advanced decision support systems.

INTRODUCTION TO MODERN DECISION SUPPORT SYSTEMS

An Overview of Business Analytics, Decision Support Systems, Business Intelligence, Data Science, and Artificial Intelligence: Need for Decision Support and Analytics - Decision Making Process and Computerized Decision Support Framework - Evolution of Computerized Decision Support to BI/Analytics/Data Science - Overview of Analytics and AI - Business Applications of Artificial Intelligence - Application Case Studies for Statistical Modeling and Visualization

(9)

PREDICTIVE ANALYTICS AND MACHINE LEARNING FOR DECISION SUPPORT
Predictive Analytics based Decision Support Application Case Studies:

Data Mining -Support Vector Machines

Deep Learning: Applications of Shallow Neural Networks and Deep Neural Networks

Cognitive Computing: IBM Watson as a Case Study

(5)

Text Mining, Sentiment Analysis, and Social Analytics: Text Analytics and Text Mining Overview - Natural Language Processing - Sentiment Analysis – Web Mining Overview – Search Engines – Web Usage Mining – Social Analytics

(7)

PRESCRIPTIVE ANALYTICS AND BIG DATA FOR DECISION SUPPORT

Prescriptive Analytics with Optimization and Simulation: Model-Based Decision Making - Structure of Mathematical Models for Decision Support - Certainty, Uncertainty, and Risk - Multiple Goals, Sensitivity Analysis, What-If Analysis, and Goal Seeking – Introduction to Simulation – Application Case Studies.

(9)

Big Data, Location Analytics, and Cloud Computing Technologies: Application Case Studies

(3)

ROBOTICS, SOCIAL NETWORKS, AI, AND IoT

Robotics Overview – Illustrative Applications of Robotics

Group Decision Making, Collaborative Systems, and AI Support: Making Decisions in Groups – Group Support Systems for Decision Making – Collective Intelligence and Collaborative Intelligence – Crowdsourcing as a Method for Decision Support

Knowledge Systems: Expert Systems, Recommenders, Chatbots, Virtual Personal Assistants, and Robo Advisors

(9)

CAVEATS OF ANALYTICS AND AI

Implementation Issues: From Ethics and Privacy to Organizational and Societal Impacts: Overview – Legal, Privacy, and Ethical Issues, Deployment of Intelligent Systems, Impact of Intelligent Systems on Organizations, Future of Intelligent Systems (3)

Total Hours: 45 Hours

TEXT BOOK

1. *Ramesh Sharda, Dursun Delen, Efraim Turban, "Analytics, Data Science, & Artificial Intelligence: Systems for Decision Support", 11th Edition, Pearson, 2020.*

REFERENCE BOOK

1. *Ramesh Sharda, Dursun Delen, Efraim Turban, "Decision Support and Business Intelligence Systems, 9th Edition, Pearson, 2013.*

20MSSE15 - BUSINESS INTELLIGENCE

Contact Hours

L	T	P	C
3	0	0	3

PREREQUISITES

20MSS44, 20MSSE09

ASSESSMENT: THEORY

COURSE OUTCOME
CO1: Describe the concepts and techniques of business intelligence.
CO2: Make better decisions by conducting in-depth analysis of both technical and business problems.
CO3: Apply Business Intelligence methods and techniques in addressing strategic business problems in organizations.
CO4: Develop efficient and effective BI project solutions for real time applications.
CO5: Design prototype model and ETL process for any BI project.

BASICS OF BUSINESS INTELLIGENCE

Business intelligence: Definition - Effective and timely decisions - data, information and knowledge - role of mathematical models - BI architectures. 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 model.

(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

(7)

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. **BI Applications**: Marketing models – Business case studies – Logistics and production models – Business case studies

(10)

TOTAL: 45

TEXT BOOKS

1. *Carlo Vercellis, "Business Intelligence: Data mining and Optimization for Decision Making", John Wiley and Sons, 2009. Para (1)*
2. *Larissa T.Moss and ShakuAtre, "Business Intelligence Roadmap: The Complete project life cycle for decision support applications", Addison Wesley, 2003. Para (2 -5).*

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

20MSSE16   VIRTUAL REALITY AND AUGMENTED REALITY

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: THEORY

COURSE OUTCOME
CO1 : Explain the understanding of fundamental computer vision, computer graphics and human-computer interaction techniques related to VR/AR
CO2: Explain the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
CO3: Understand the system of human vision and its implication on perception and rendering
CO4: Apply the concepts learned when developing VR applications.
CO5: Describe how VR systems work

INTRODUCTION
Virtual Reality - Modern VR Experiences- Hardware and Software for Virtual Reality - Geometry of virtual worlds.
Augmented Reality : Introduction - Working - Concepts related to Augmented Reality - Ingredients of an Augmented Reality Experience

(9)

PHYSIOLOGY OF HUMAN VISION
Behavior of Light - Lenses - Cameras and Displays From Cornea to Photoreceptors - From Photoreceptors to the Visual Cortex - Eye Movements - Implications for VR.

(9)

PERCEPTION AND RENDERING
Visual Perception: Perception of Depth - Perception of Motions - Perception of Color - Combining sources of Information.
Visual Rendering: Ray Tracing and Shading Models - Rasterization - Correcting Optical Distortions- Improving Latency and Frame Rates - Immersive Photos and Videos.

(9)

MOTION AND TRACKING
Motion : Velocities and Accelerations - The Vestibular System - Physics and Virtual World - Mismatched Motion and Vection
Tracking: Tracking 2D Orientation - Tracking 3D Orientation - Tracking Position and Orientation - Tracking Attached Bodies - 3D Scanning of Environments

(9)

INTERACTION AND EVALUATION
Physics of Sound - Physiology of Human Hearing - Auditory Perceptron - Auditory Rendering Evaluating VR Systems and Experiences: Perceptual Training - Recommendations for Developers - Comfort and VR Sickness - Experiments on Human Subjects.   (9)

TOTAL HOURS : 45

TEXT BOOKS
1. Alan B. Craig, "Understanding Augmented Reality, Concepts and Applications", Morgan Kaufmann, 2013.(Para -1)
2. Steven M. LaValle, "Virtual Reality", Cambridge University Press, 2019.(Para 2-5)

REFERENCE BOOKS
1. William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann Publishers, 2002.
2. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", Springer, 2005.

20MSSE17 COMPILER DESIGN

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS15, 20MSS31

ASSESSMENT: THEORY

COURSE OUTCOME
CO1: Describe the design of a compiler and the phases of program translation from source code to executable code and the files produced by these phases.
CO2: Explain lexical analysis phase and its underlying formal models such as finite automata and their connection to language definition through regular expressions and grammars and also explain syntax analysis phase and identify the similarities and differences among various parsing techniques.
CO3: Use formal attributed grammars for specifying the syntax and semantics of programming languages and being able to identify the effectiveness of optimization.

INTRODUCTION TO COMPILERS

Compilers – Analysis – Synthesis model of compilation – Analysis of the source program – The phases of a compiler – Cousins of the compiler – Compiler construction tools - Error handling. **(7)**

LEXICAL ANALYZER

Lexical analysis – Role of lexical analyzer – Tokens, Patterns and lexemes – Input buffering – Specification of tokens – Regular expressions – Recognition of tokens – Transition diagrams – Implementing a transition diagram – Finite Automata - Regular expression to NFA – Conversion of NFA to DFA - Applications of finite automata for recognizing tokens. **(10)**

SYNTAX ANALYZER

Syntax analysis – Role of parser – Context-free grammars – Derivations – Writing a grammar – Top Down parsing – Recursive descent parsing – Predictive parsers – Non-recursive predictive parsers – Construction of predictive parsing tables – Bottom up parsing – Handles – Shift reduce parser – Operator-precedence parsing. LR parsers – Canonical collection of LR (0) items – Constructing SLR parsing tables. **(10)**

INTERMEDIATE CODE GENERATION

Syntax directed translation – Syntax directed definitions – Synthesized attributes – Inherited attributes – Intermediate code generation – Intermediate language – Construction of syntax trees – DAG – Bottom-Up evaluation of S attributed definitions – Implementations – Assignment statements – Boolean expressions – Back patching. **(10)**

CODE OPTIMIZATION

Principle sources of optimization – Optimization of basic blocks – Loops in flow graphs – Introduction to global data flow analysis.

CODE GENERATION

Issues in design of code generator – Target machine – Time storage management – Basic blocks and flow graphs – Code generation algorithm – DAG representation – Peephole optimization.   **(8)**

Total Hours: 45

TEXT BOOKS

1. *Alfred V. Aho, Ravi Sethi and Jeffrey D Ullman, "Compilers, Principles, Techniques and Tools", Addison Wesley Longman (Singapore Pvt. Ltd.), 2011.*
2. *Alfred V. Aho, Jeffrey D Ullman, "Principles of Compiler Design", Addison Wesley, 1988.*
3. *Jean Paul Tremblay, Paul G Sorenson, "The theory & practice of compiler writing", International student edition, 1985.*

REFERENCE BOOKS

1. *David Gries, "Compiler Construction for Digital Computers", Wiley International Edition, 1971.*
2. *William A Barrett, Rodney M Bates, David A Gustafson, John D Couch, "Compiler Construction, Theory & Practice", Galgotia publications Pvt. Ltd., New Delhi, 2nd edition, 1986.*
3. *David Galles, "Modern Compiler Design", Pearson Education, 2008*
4. *Steven S. Muchnick, "Advanced Compiler Design & Implementation", Morgan Kaufmann Publishers, 2000.*
5. *Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", Pearson Education, 2008.*

20MSSE18 – SOFTWARE USER INTERFACE DESIGN

	Contact Hours		
L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : Theory

COURSE OUTCOME
CO1: Understand the principles of UI/UX Design
CO2: Acquire a deep understanding of the design process and purpose
CO3: Learn the basics of design requirement of windows
CO4: Build web applications using user interface principles
CO5: Use the techniques for evaluation of user interface

INTRODUCTION
Human-Computer interface- characteristics of graphics interface - Direct manipulation graphical system - web user interface-popularity- characteristic & principles.   (9)

User interface design process - obstacles-usability-human characteristics in design - Human interaction peed-business functions - requirement analysis - Direct-Indirect methods - basic business functions -Design standards - system timings - Human consideration in screen design - structures of menus - functions of menus - contents of menu - formatting -phrasing the menu - selecting menu choice-navigating menus - graphical menus.   (10)

Windows: Characteristics - components - presentation styles - types-managements - organizations-operations - web systems - device-based controls: characteristics - Screen -based controls: operate control - text boxes - selection control - combination control - custom control - presentation control.   (9)

Text for web pages - effective feedback - guidance & assistance - Internationalization - accessibility-Icons-Image - Multimedia - coloring.   (9)

Windows layout-test :prototypes - kinds of tests - retest - Information search - visualization - Hypermedia – Internationalization – Animation – Mobile User Interface -Software tools. (9)

TOTAL HOURS : 45

TEXT BOOK
1. *Wilbent. O. Galitz ,"The Essential Guide to User Interface Design", John Wiley& Sons, Third Edition , 2007.*

REFERENCE BOOKS
1. *Ben Sheiderman, "Design the User Interface", Pearson Education, Fourth Edition 2005.*
2. *Alan Cooper, "The Essential of User Interface Design", Wiley – Dream Tech Ltd., 2007.*

20MSSE19   ENTERPRISE APPLICATION DEVELOPMENT

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS45

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Describe the role of Component Technologies in developing reusable and easy accessible enterprise application
CO2: Develop the client applications (browser / Java client) using J2EE platform by analyzing the requirements of the given system
CO3: Design and Develop the web tier components of an enterprise application using Servlet
CO4: Construct the application components includes Process and Data components using Enterprise Java Bean Technologies
CO5: Integrate the transaction management activities with the developed applications using the various components of enterprise

USING J2EE PLATFORM

INTRODUCTION
Java EE 7 Platform highlights – Java EE application model – Distributed multitiered applications – Java EE Containers – Java EE application assembly and deployment – Development roles – Java EE 7 APIs – Java EE 7 APIs in the Java platform standard edition 7. **Platform Basics** : Resource creation – Packaging   **(9)**

THE WEB TIER
Java Servlet Technology – Servlet Life Cycle – Sharing information – Creating and initializing a Servlet – Writing Service methods - Filtering requests and responses – Invoking other web resources – Accessing the web context – Maintaining client state – Asynchronous processing
                                                                                            (9)

JAVA SERVER PAGES
Elements of JSP – JSP Syntax and Semantics – Expression, Scriptlets and Declarations – Request dispatching – Session and Thread Management.**JSP Tag extensions :**
Introduction to custom tags – Expression Language – The JSP standard tag library (JSTL) – JSP fragments
                                                                                            (9)

ENTERPRISE BEANS
Session Bean – Message Driven Bean – Accessing enterprise Beans – Contents – Naming conventions – Life cycle – Getting started with Enterprise Beans – Running the enterprise

Bean examples – Using the embedded enterprise bean container – Using Asynchronous method invocation in session beans

(9)

INTRODUCTION TO THE JAVA PERSISTENCE API
Entities – Entity Inheritance – Managing Entities – Querying Entities – The Java Persistence Query Language – Query Language Terminology – Creating Queries using the Java Persistence Query Language – Simplified Query Language Syntax – Example Queries – Full Query Language Syntax – Using the criteria API to create queries

(9)

TOTAL HOURS: 45

TEXT BOOKS

1. *Eric Jendrock, Ricardo Cervera – Navarro, Ian Evans, "The Java EE 7 Tutorials" Volume I & II, Fifth Edition, Addison – Wesley Publications, 2014. Para(1,2, 4,5)*
2. *Phil Hanna, "The Complete Reference JSP 2.0", McGraw Hill Education, Second Edition, 2017.(Para - 3)*

20MSSE20 - DESIGN THINKING

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME
CO1: Given a problem, analyze and determine the drivers and target groups of the problem
CO2: Empathise and build journey maps of customer persona and define requisites of a solution required to address the issues in the problem study
CO3: Ideate, design and present the creative ideas in an understandable way using appropriate methods, based on the journeys of persona under study
CO4: Elucidate customer co creation and modify the generated ideas based on feedback, for the problem under study
CO5: For the chosen idea, develop the prototype and implement it using appropriate techniques

DESIGN THINKING
Why and How of Design Thinking : Design and Design Thinking – Need for Design Thinking - Myths – Four Stages of Design Thinking Process – Four Questions, Ten Tools and Project Management aids(PMA).

(7)

EXPLORATION
Empathise and Define - Importance of reframing – Visualization: Steps – Persona – Story Boarding – Imagery. Journey Mapping: Steps – Interviewing – Mapping the journey of each persona – Journey Mapping Vs. Market Research. Value Chain Analysis: Steps – analysing the environment, strategic capabilities and bargaining power – assessing vulnerabilities. Mind Mapping: Steps – 5Ws. PMA: The Design Brief. Case studies – PMA preparation

(10)

IDEA GENERATION
Ideate – PMA: Design Criteria – Brainstorming: Steps – Sketching – Concept Development - Presenting ideas – Anchors – PMA: Napkin Pitch - Using the Four Quadrants - case studies – PMA preparation

(9)

REFINEMENT
Prototype – dimensions and tools – Assumption Testing: Steps – generic and specific tests to be cleared – critical assumptions – organize data needed – identify red flags. Rapid Prototyping: Early prototypes, functional prototypes and Market test prototypes – Steps. Case studies - PMA preparation

(9)

TESTING AND LAUNCH

What Works: Invention and Innovation – Customer Co-creation: Need – Steps – Feedback. Learning Launch: Steps – Importance – PMA: learning guide – Case studies – PMA preparation. Use of social technologies
Leading growth and Innovation in an Organization – Case studies.

(10)
TOTAL HOURS: 45

TEXT BOOK
1. *Jeanne Liedtka and Tim Ogilvie "Designing for Growth: A Design Thinking Tool Kit for Managers" , Columbia University Press, 2011.*

REFERENCE BOOKS
1. *Gavin Ambrose and Paul Haris, "Basic Design 08 Design Thinking", AVA Publishing, 2010.*
2. *Jeanne Liedtka, Tim Ogilvie, and Rachel Brozenske, "The Designing for Growth Field Book: A Step-by-Step Project Guide", Columbia University Press, 2014.*
3. *Karl T. Ulrich, "Design – Creation of Artifacts in Society", University of Pennsylvania Press, 2011.*

20MSSE21 - BUSINESS PROCESS MANAGEMENT

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME
CO1: *Discover the processes associated with the given business problem*
CO2: *Analyze the business process and identify the issues of the process.*
CO3: *Design the business process by applying the necessary changes.*
CO4: *Develop the IT solution to automate the business process*
CO5: *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 HOURS: 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.*

20MSSE22 - SOFTWARE LANGUAGE ENGINEERING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS22, 20MSS34

ASSESSMENT : THEORY

COURSE OUTCOME
CO1: Conceive the syntax and semantics of control structures and data abstractions for programming languages.
CO2: Conceive the features such as un-typed and simply-typed in functional and imperative languages.
CO3: 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 HOURS : 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*

20MSSE23 - ACCOUNTING AND FINANCIAL MANAGEMENT

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Given a set of business transactions, prepare books of accounts and verify correctness using trial balance, for any business organization

CO2: For a given trial balance, prepare statements of financial accounting to ascertain the profit, for any trading or manufacturing organization

CO3: Prepare Financial reports using ratio analysis, working capital management, and budgetary control techniques and present facts to assist in strategic decision making, given a set of investment options for a business

CO4: Analyse the various sources available for getting funds for the business and the cost involved in it, and decide the proportion of capital for business

CO5: Evaluate the investment options available and select the best alternative for investments

Financial Accounting: Definition- Three Activities - Generally Accepted Accounting Principles - Accounting Equation: Balance sheet, Income Statement and Retained Earnings. Recording Process: Debit and Credit - Steps in Recording Process – Making Journal Entries, Posting the Journal Entries to Ledger Accounts, Posting the Ledger to Trial Balance, Preparation of Trial Balance. (10)

Understanding the Financial Statements: Understanding the Financial Statements Balance Sheet, Income Statement and Cash flow Statement - Need and Linkages - Individual elements of Financial Statements - Preparation of Common Size Balance sheet and Income Statement.

(7)

Financial Ratios: Profitability Ratios, Return Ratios, Liquidity Ratios, Stability Ratios, Efficiency Ratios - Interpretation of Ratios. Working Capital Analysis: Working Capital Calculation - Impact of Working Capital on business - Negative and Positive Working Capital - Perspective of the banker and owner in analysing working capital - Calculating Cash Conversion Cycle - Analysis of Receivables, Inventory, Cash and Payables. (7)

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. (5)

Financial Management : Financial Management : Meaning - Importance of Finance - Objectives - Scope- Financial Decisions. Time Value of Money : Valuation Concepts: Compounding Value, Multiple compounding, Future Value, Compounding Annuities, Present Value – Risk and Return: Types of Risk, Measures of Risk, Efficient Risk-Return Trade off, Capital Asset Pricing Model. Sources of Finance: Sources of Finance : Sources and its features - Types-Long term sources- Equity, Preferred stock, Retained earnings, Term Loan- Short term sources - Bank Sources. Determining the optimal Capital Structure – Theories of Capital Structure (11)

Capital Budgeting: Capital Budgeting : Concept, Importance, Kinds of Investment Proposals, Capital appraisal Methods: Payback period method, Net Present Value method, Present value index method, Accounting rate of return method - Analysis of Risk and Uncertainty in Capital Budgeting.(Problems) (5)

TOTAL HOURS : 45

TEXT BOOKS

1. J*ain and Narang, "Accounting for Managers", Kalyani Publishers, 2006 (Para 1,2)*

2. Thomas .R. Robinson and et.al, "International Financial Statement Analysis", John Wiley & Sons, Inc, 2009 (Para 2)

3. Sharma R K, Shashi K Gutpa, "Management Accounting and Financial Management", Kalyani Publishers, 1996 (Para 3 -6)

REFERENCE BOOKS

1. Horngren, Sundem, Elliot, "Introduction to Financial Accounting", Pearson Education, 2005

2. Maheshwari S.N, "An Introduction of Accounting", Vikas Publishing House Pvt Limited 2005.

3. Narayanaswamy, "Financial Accounting:A Managerial Perspective", PHI Learning Pvt Ltd, 2008.

4. Khan and Jain, "Financial Management", Tata McGraw Hill, New Delhi, 2008

5. Pandey .I.M," Financial Management", Vikas Publishing House, New Delhi, 2005

7. Prasanna Chandra, "Financial Management", Tata McGraw Hill, New Delhi, 2008

8. Maheshwari .S.N," Financial Management", Kalyani Publishers, 2010

9. Brealey and Meyers, "Principles of Corporate Finance", Tata McGraw Hill,New Delhi, 2008

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

20MSSE24   HUMAN COMPUTER INTERACTION AND INTERFACE

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of instructor

ASSESSMENT: THEORY

COURSE OUTCOME

CO1: Explain how to develop user interfaces for interactive systems.

CO2: Apply the knowledge to develop high-quality user interfaces for interactive systems.

CO3: Apply the basics of Virtual reality and 3D interactions

CO4: Analyse the design rules involved in the HCI patterns

CO5: Explain the guidelines for Interaction Devices

CO6: Develop an understanding with Documentation Search and Visualization

INTRODUCTION USABILITY OF INTERACTIVE SYSTEMS

Usability Requirements - Usability Measures - Usability Motivations - Universal Usability. Guidelines, Principles, and Theories for Designers.   (5)

DEVELOPMENT PROCESSES

Managing Design Processes: Organizational Design to Support Usability - The Four Pillars of Design- Development Methodologies- Ethnographic Observation - Participatory Design-Scenario Development- Social Impact Statement for Early Design Review - Legal Issues. **Evaluating Interface Designs:** Expert Reviews - Usability Testing and Laboratories-Survey Instruments- Acceptance Tests- Evaluation During Active Use-Controlled Psychologically Oriented Experiments

(8)

INTERACTION STYLES

Direct Manipulation and Virtual Environments: Introduction - 3D Interfaces-Teleoperation- Virtual and Augmented Reality. **Menu Selection, Form Fillin, and Dialog Boxes:** Task-Related Menu Organization- Single Menus- Combinations of Multiple Menus - Content Organization- Fast Movement through Menus- Data Entry with Menus: Form Fillin, Dialog Boxes and Alternatives-Audio Menus and Menus for Small Displays.

(8)

INTERACTION DEVICES

Keyboards and Keypads- Pointing Devices- Speech and Auditory Interfaces- Displays - Small and Large.

Collaboration and Social Media Participation -Goals -Asynchronous Distributed Interfaces- Synchronous Distributed Interfaces-Different Place, Same Time -Face-to-Face Interfaces.   (8)

DESIGN ISSUES

Quality of Service - Models of Response Time Impacts- Expectations and Attitudes- User Productivity- Variability in Response Time- Frustrating Experiences- Balancing Function and Fashion: Error Messages- Nonanthropomorphic Design- Display Design- Web Page Design-Window Design-Colour   (8)

DOCUMENTATION SEARCH AND VISUALIZATION

User Documentation and Online Help- Information Search: Searching in Textual Documents and Database Querying - Multimedia Document Searches-Advanced Filtering and Search Interface. Information Visualization: Data Type by Task Taxonomy - Challenges for Information Visualization.   (8)

TOTAL HOURS: 45

TEXTBOOK
1. *Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs," Designing the User Interface: Strategies for Effective Human-Computer Interaction ", 5th Edition Pearson, Education 2010*

REFERENCE BOOK

1. *Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 5th Edition, Pearson, Education 2004.*

20MSSE25 QUANTUM COMPUTING

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES
20MSS12, 20MSS31

ASSESSMENT: THEORY

COURSE OUTCOME
> *CO1: Ability to work with quantum programming languages.*
> *CO2: Design quantum circuits.*
> *CO3: Implement quantum algorithms*
> *CO4 : Analyze Quantum Algorithms*

Quantum States and Qubits: Introduction, The Atoms of Computation, Bloch sphere representation of a qubit, multiple qubits, representing Qubit states, The Case for Quantum.

(9)

Linear Algebra: Complex Numbers versus Real Numbers, Vectors, Diagrams of Vectors, Lengths of Vectors, Scalar Multiplication, Vector Addition, Orthogonal Vectors, Multiplying a Bra by a Ket, Bra-Kets and Lengths, Bra-Kets and Orthogonality, Orthonormal Bases, Vectors as Linear Combinations of Basis Vectors, Ordered Bases, Length of Vectors, Matrices. **(5)**

Multiple Qubits and Entanglement: Introduction, Multiple Qubits and Entangled States, Phase Kickback, More Circuit Identities, Proving Universality, Classical Computation on a Quantum Computer. Quantum Circuits - Single qubit gates, multiple qubit gates, design of quantum circuits- Quantum Teleportation. **(15)**

Quantum Protocols and Quantum Algorithms: Defining Quantum Circuits, Deutsch-Jozsa Algorithm, Shor's Algorithm, Grover's Algorithm. **(9)**

Quantum Cryptography:
Quantum cryptography, BB84, B92 protocols. **(7)**

TOTAL: 45

TEXT BOOKS
1. *Nielsen M. A., "Quantum Computation and Quantum Information", Cambridge University Press. 2002.*
2. *Olivier Ezratty, "Understanding Quantum Technologies", ebook, 2021.*
3. *Mermin, N.D., "Quantum computer science", Cambridge University Press, 2007.*
4. *James L. Weaver & Frank J. Harkins, "Qiskit Pocket Guide Quantum Development with Qiskit", OReilly, 2021.*
5. *Thomas G. Wong, "Introduction to Classical and Quantum Computing, ebook, 2022.*

20MSS26-REAL TIME SYSTEMS

Contact Hours

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MSS35, 20MSS44,20MSS52

ASSESSMENT : THEORY

COURSE OUTCOME

CO1: Given the requirements and timing constraints, develop hard and soft real-time systems

CO2: Given the requirements and timing constraints, choose an appropriate scheduling algorithm to meet the requirements and justify the selection.

CO3: For a given set of requirements, develop real-time applications exploiting the features of the given Real-Time operating system.

CO4: For a given set of requirements, compare the real-time communication protocols and choose one to meet the timing constraints.

CO5: Recast 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 HOURS: 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.*

20MSSL01 - SOA and WEB SERVICES LAB

PRE-REQUISITES
20MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

CO1: Demonstrate the use of web service in real time web application development
CO2: Design and develop appropriate web services according to the requirements of given web application
CO3: Ability to select the right web service component to be used in applications wherever required to reduce development time of the web application
CO4: Ability to select the right web service component to be used in applications wherever required to reduce development time of the web application
CO5: Develop new web services based on the user requirements and consume them in web and mobile applications.

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

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

20MSSL02 - PARALLEL COMPUTING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS15

ASSESSMENT : PRACTICAL

COURSE OUTCOME

CO1: Given a parallel algorithm, develop the system using MPI.
CO2: Given a parallel code, analyze its performance, determine computational bottlenecks, and optimize the performance of the code.
CO3: Given a parallel code, diagnose the errors and fix them
CO4: Given a problem, implement an efficient and correct code to solve it, analyze its performance
CO5: 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

20MSSL03 BLOCKCHAIN TECHNOLOGIES LAB

Contact Hours

L	T	P	C
0	0	4	2

PREREQUISITES
Consent of the Instructor

ASSESSMENT: LABORATORY

COURSE OUTCOME

CO1: *Illustrate the role of cryptography in securing blockchain*
CO2: Interact with a blockchain system by sending and reading transactions.
CO3: Design, build, and deploy distributed applications

THE FOLLOWING TO BE PRACTICED IN THE LAB SESSIONS

1. Test the properties of cryptographic Hashing
2. Perform Using JavaScript
   a. Creating a Blockchain
   b. Implementing Proof‑of‑Work
   c. Miner rewards & generating transactions
   d. Signing transactions
3. Create a private Ethereum Blockchain.
4. Test the properties of Ethereum transactions and Cryptographic Hashing - the authenticity and security of Ethereum transactions (Using MetaMask)
5. Develop smart contracts for Ethereum Blockchain
6. Interacting with smart contracts via the web.

20MSSL04 - DATA MINING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSSE09

ASSESSMENT : **PRACTICAL**

COURSE OUTCOME

CO1: *Employ data cleaning techniques for normalization and standardization of given dataset.*
CO2: *Determine the mining solutions using data mining techniques in real time problems.*
CO3: *Find the outliers using various Outlier Detection methods in a given dataset.*
CO4: *Evaluate the accuracy of measures for text retrieval and classification of Web documents.*
CO5: *Build a multi-dimensional data cube for a real time scenario.*

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 Itemsets 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 methods.

9. Evaluation of measures for text retrieval.

10. Implementation of Web mining algorithms

11. Design a simple multidimensional data cube.

Tool : RapidMiner / Wega /R

20MSSL05 – BIG DATA ARCHITECTURE LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS47

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: Analyze the analytical techniques on a variety of Big data application scenarios.
CO2: Apply Hadoop clusters and MapReduce programs for parallel processing of big data.
CO3: Practice structured/unstructured data analysis using PIG and HIVE programs.
CO4: Experiment the live streaming data through Apache's SPARK and KAFKA.
CO5: Generate: Generate dynamic solutions for big data analytics problems using MapReduce framework.

CONCEPTS TO BE COVERED

1. Configure Hadoop working environment
2. Import /Export the data from data center (website / unstructured) to HDFS
3. Import /Export the data from SQL to HDFS
4. Parallelize Input/output process /compute process using MAPREDUCE
5. Perform structured/unstructured data analysis using (Internal Map Reduce) PIG
6. Perform structured data process/analysis using HIVE
7. Perform live stream data analysis using SPARK and KAFKA

20MSSL06- PREDICTIVE ANALYTICS LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: Apply and Implement Moving Average Method for handling missing data.
CO2: Practice the forecasting techniques such as Exponential Smoothing Methods, ARMA and ARIMA models for analysing time series data.
CO3: Practice Logistic regression for predicting the binary classification.
CO4: Apply and Implement Principal Component and Factor Analysis techniques for reducing the data.
CO5: Generate the groups of data using k-means and hierarchical clustering techniques.
CO6: Evaluation of time series forecasting, logistic regression, principal component analysis, factor analysis and k-means methods using appropriate strategy.

Practice the following concepts on the analytics applications in the fields such as Healthcare, Education, Business, Finance, Agriculture and Manufacturing using appropriate software.

Concepts to be Practiced:

- Data Collection (Time series data, Multivariate data) through dataset creation.
- Missing data handling using Moving Average method.
- Time series forecasting using Exponential Smoothing, ARMA and ARIMA methods.
- Linear discriminant analysis using Fisher's approach.
- Prediction of classification using Logistic Regression Technique.
- Evaluation of Logistic Regression Model.
- Data Reduction using Principal Component and Factor Analysis Methods.
- Determine optimal number of clusters on a given dataset.
- Clustering the dataset into groups of data using K-Means Clustering
- Hierarchical clustering methods to generate clusters.

20MSSL07 - NATURAL LANGUAGE PROCESSING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS31, 20MSS85

ASSESSMENT: PRACTICAL

COURSE OUTCOMES
CO1: Acquire knowledge in Fundamentals of Natural Language Processing.
CO2: Apply various techniques to access and process text from the Web.
CO3: Gain experience in categorizing and tagging words.
CO4: Develop models for text classification using Supervised Learning Algorithms
CO5: Apply and analyze sentence structure using context free grammar.

CONCEPTS TO BE COVERED
1. Access Text Corpora and Lexical Resources
    (i)   Conditional Frequency Distribution
    (ii)   WordNet
2. Processing Raw Text
    (i)   Accessing Text from the Web
    (ii)   Regular Expression for Detecting Word Patterns
    (iii)   Normalizing the Text
    (iv)   Regular Expression for Tokenizing text
3. Categorizing and Tagging Words
    (i)   Automatic Tagging
    (ii)   N-Gram Tagging
    (iii)   Transformation-Based tagging
4. Text Classification using Supervised Learning Algorithm
5. Extracting Information from Text
    (i)   Chunking
    (ii)   Named Entity Recognition
    (iii)   Relation Extraction
6. Analyzing Sentence Structure using Context Free Grammars
7. Analyzing the Synonym of Sentences

Reference Books
1. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, O_Reilly Media, 2009.
2. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.

20MSSL08   Meta-Heuristic Learning LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOMES

CO1: Understand and perform binary and continuous Genetic Algorithm

CO2: Apply Evolutionary Computation Methods to find solutions to complex problems

CO3: Implement Optimization techniques on specific real time applications

CO4: Understand fundamental concepts of immune systems

CO5: Develop a basic fuzzy logic system for a typical computing application

TOOLS: PYTHON/MATLAB

TOPICS TO BE COVERED

1. Simulated Annealing Algorithm
2. Genetic Algorithm
3. Evolutionary Programming
4. Particle Swarm Optimization
5. Ant Clustering Algorithm
6. Ant Colony Optimization
7. Bone Marrow Models
8. Negative Selection Algorithms
9. Clonal Selection Algorithm
10. Forrest's Algorithm
11. Elementary Operations on Fuzzy set
12. Fuzzy Clustering Algorithms

20MSSL09 - DEEP LEARNING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS12, 20MSS21,20MSS32

ASSESSMENT: PRACTICAL

COURSE OUTCOME
CO1: Develop a simple data analytics application using a neural network model
CO2: Develop a text analytical application using recurrent networks.
CO3:Develop a feature extraction and image recognition application using convolutional network

Applications pertaining to the following factors to be implemented:

1. Practice the representation of real world data such as vector data, time-series data, image data, video data.
2. Design and implement a neural network model with the better activation functions, weight-initialization schemes, loss function and optimization schemes for any data analytics application(classification problems).
3. Design and implement the deep forward network model for sentimental or behavior analytics.
4. Automate the computer vision processes using convolutional neural networks.
5. Implementation of text based and time-series based analytical applications using recurrent neural networks.
6. Generate images using autoencoders.

20MSSL10 - BUSINESS INTELLIGENCE LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

20MSSE09, 20MSSE15

ASSESSMENT : LABORATORY

COURSE OUTCOME

CO1: Generation of business reports and presentations using BI Tools for the given case studies.

CO2: Evaluate data by extracting and Transforming using ETL tools for any given dataset.

CO3: Effectively apply data mining techniques in a variety of business applications to generate mining solutions.

CO4: Design and implement practical business intelligence solutions for real time projects.

CO4: 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 BI visualization reports using Business Intelligence tools.

3. Create a Dashboard for viewing and analyzing the BI reports.

Tools : Tableau /Pentaho /JasperSoft / BIRT

20MSSL11- COMPUTER VISION LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: can implement the image fundamentals and mathematical transforms necessary for image processing.

CO2: can apply various enhancement and Filtering techniques.

CO3: can execute various image segmentation techniques.

LIST OF EXPERIMENTS

1. Calculate image statistics for an image.
2. Filtering operations on images.
3. Morphological operations on images.
4. Mask operations on matrices.
5. Basic operations on images.
6. Blur detection.
7. Display of Grayscale Images.
8. Histogram Equalization.
9. Display of color images.
10. Conversion between color spaces.
11. Edge detection using Operators.
12. 2-D DFT and DCT.
13. DWT of images.
14. Segmentation using watershed transform.
15. Structure from motion.
16. 2D Match move/ Augmented Reality.

20MSSL12 MACHINE LEARNING LAB

L	T	P	C
0	0	4	2

PRE- REQUISITES
20MSS36

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: Able to prepare the data for machine learning using data pre-processing and dimension reduction techniques.

CO2: Able to build regression and classification models using benchmark datasets and give insights.

CO3: Able to evaluate the performance of models using different performance measures.

CO4: Able to use clustering techniques to group data and analyze the clusters.

CO5: Able to design and develop prediction systems by choosing appropriate machine learning algorithms using real-time datasets.

CONCEPTS TO BE COVERED

- Build Regression models to predict future values for datasets like rainfall, earthquake etc..
- Build Classification models
    - Decision tree classifier(ID3)
    - Naïve Bayes Classifier
    - k-Nearest Neighbor Classifier
    - Perform cross validation and evaluate the models using various performance metrics.
- Implement Perceptron and Artificial Neural Network for simple problems
- Implement Bayesian Belief network to demonstrate the diagnosis of medical data.
- Implement the non-parametric Locally Weighted Regression algorithm to fit data points.

- Clustering
  - Implement K-Means Clustering
  - Implement Hierarchical clustering
- Build a complete prediction system using any of the above methods with data visualization capabilities.

Note: *Benchmark datasets may be downloaded from UCI machine learning repository, Kaggle etc for each of the above problems.*

20MSSL13 VIRTUAL REALITY AND AUGMENTED REALITY LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: *Set up Unity for Virtual Environment*
CO2: Create Scenes
CO3: Create game objects
CO4: Apply color, texture, Material for Game Objects
CO5: Design and develop VR environments.

Tools : Unity / Three.js

TOPICS TO BE COVERED

1. Developing a scene
2. Adding game objects such as a cube, plane and sphere, and applying transformations on the game objects.
3. Adding video and audio sources
4. Changing the colour, material and texture of Game objects separately in a scene
5. Apply rigid body component, material and Box collider to the game Objects
6. Create an immersive environment (living room/ battlefield/ tennis court) with static game objects.
7. 3D game objects
8. Include animation and interaction in the immersive environment
9. Create a virtual environment for any use case

20MSSL14 COMPILER CONSTRUCTION LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS15, 20MSS31

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: Understand the practical approaches of the working of a compiler.

CO2: Understand and analyze the role of syntax and semantics of programming languages in compiler construction.

CO3: Use different tools in construction of the phases of a compiler for the mini language.

TOPICS TO BE COVERED

1. Description of the syntax of the source language (Mini Language) for which the compiler components are designed.
2. C Program to scan and count the number of characters, words, and lines in a file.
3. Implementation of symbol table
4. Nondeterministic finite automata to recognize identifiers, constants, and operators of the mini language.
5. Deterministic finite automata to recognize identifiers, constants, and operators of the mini language.
6. Design a lexical analyzer for the given language. The lexical analyzer should ignore redundant spaces, tabs and newlines, comments etc.
7. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.
8. Design Predictive Parser for the given language.
9. Implementation of Recursive Descent Parser.
10. Implementation of SLR Parser.
11. Design a LALR bottom up parser for the given language.
12. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree.
13. Implementation of simple code optimization techniques.
14. A program to generate machine code from the abstract syntax tree generated by the parser.

20MSSL15 ENTERPRISE APPLICATION DEVELOPMENT LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS48

ASSESSMENT : PRACTICAL

COURSE OUTCOME

CO1: Develop the client application using HTML or Java Server Page
CO2: Construct web components to process the client request and generate response in online using Java Servlet
CO3: Design and Develop reusable business logic using Session EJB framework
CO4: Generate persistent entities using Entity EJB frameworks
CO5: Develop the enterprise applications for the given scenario by identifying the suitable components

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 the client side applications using JSP
3. Design and implement online business processing through Servlet components.
4. Develop reusable business logics using Session EJB components.
5. Develop persistent entity objects using Entity EJB components

20MSSL16 – ACCOUNTING and FINANCIAL MANAGEMENT LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor.

ASSESSMENT : PRACTICAL

COURSE OUTCOME

CO1: Evaluate the various items to be included in the financial statements and create a dynamic financial model for preparing the financial statement

CO2: Develop simple models of decision-making techniques like capital budgeting and ratio analysis, Analysing the working capital of a company

CO3: Prepare a financial model for time value of money, capital budgeting and cost of capital applications

CO4: Develop a model for detailed financial statements analysis model using Excel and Python

CO5: Employ Data visualization tools on financial data to facilitate managerial decision making

CONCEPTS TO BE COVERED

1. Financial Statement Building: Financial Statement Modelling projection of Revenues, Costs and other Income statement and Balance Sheet Items. Creating a dynamic model for financial statements
2. Financial Statement Linkages for Company Model Building.
3. Time Value of Money Applications - Loan Schedule Creation, EMIs, Effect of change of parameters on EMI and Tenure;
4. Capital Budgeting Applications: Payback period, Net Present Value; Internal Rate of Return.
5. Cost of Capital: Cost of Debt, Cost of Equity, Weighted Average cost of capital
6. Capital Structure: Compute Optimal Capital Structure
7. Working Capital Analysis: Arriving at working capital requirement
8. Creating Analysis models for budget, ratio and Capital budgeting.
9. Creating decision support reports on various transaction data and analysis data - Data Visualization and Analysis of financial statements

20MSSL17 QUANTUM COMPUTING LAB

Contact Hours

L	T	P	C
0	0	4	2

PRE-REQUISITES
20MSS12, 20MSS31

ASSESSMENT: PRACTICAL

COURSE OUTCOME

CO1: Able to design quantum circuits.
CO2: Able to implement quantum algorithms.
CO3: Apply quantum algorithms and design quantum circuits to solve real world use cases.

CONCEPTS TO BE COVERED

Working with open source frameworks such as IBM Qiskit, Microsoft Q#, Google Circ, Xanadu Pennylane

1. Installation and working with Open Source tools

2. Qubit state representations-Bloch Sphere, QSphere, Histogram

3. Single qubit gates

4. Multi qubit gates

5. Generate Bell states

6. Generate GHZ state*

7. Quantum Teleportation

8. Deutsch Algorithm

9. Deutsch Jozsa Algorithm

10. Shor's algorithm

11. Grover's Algorithm

12. Applications – Design and implement Quantum Circuits, Quantum Cryptography, Quantum Machine Learning