COIMBATORE INSTITUTE OF TECHNOLOGY

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

COIMBATORE - 641 014, TAMILNADU, INDIA

DIAMOND JUBILEE

(1956 - 2016)

DEPARTMENT OF COMPUTING

M.Sc. (DECISION AND COMPUTING SCIENCES)

Curriculum and Syllabi

Under Choice Based Credit System

(For the students admitted during 2017 - 2018 and onwards)

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COIMBATORE INSTITUTE OF TECHNOLOGY

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

VISION AND MISSION OF THE INSTITUTE

VISION

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

MISSION

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

DEPARTMENT OF COMPUTING
COIMBATORE INSTITUTE OF TECHNOLOGY

VISION AND MISSION OF DEPARTMENT OF COMPUTING

VISION

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

MISSION

The Mission of Department of Computing is

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

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

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

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 **Expertise in Decision Making :** Evolve as decision scientists with an in-depth knowledge of multiple business domains across all functional areas.

PEO2 **Expertise in Software Development :** Be competent to develop software products by strategic blending of computing technology and management expertise that facilitate informed decision making.

PEO3 **Leadership and Lifelong Learning :** Demonstrate leadership qualities through acquisition of intrapreneurship and entrepreneurship traits and engage in active contribution to society through innovative solutions of global impact.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

PROGRAMME OUTCOMES

PO1 : Apply mathematical and statistical modelling for analysis of business problems that aid management to make data driven decisions.

PO2 : Perform quantitative and qualitative data analytics in functional areas of business like marketing, human resource management, finance, etc.

PO3 : Visualize and infer meaningful insights to facilitate strategic and operational decisions.

PO4 : Apply foundations of business management blended with computing science to address issues in decision-making.

PO5 : Develop smart enterprise applications applying software engineering principles and business domain knowledge.

PO6 : Design and develop software products and services for strategic decision making, business analytics and intelligence.

PO7 : Align and utilize information technology infrastructure, analytics and decision-making skills effectively to realize the organization's goals.

PO8 : Contribute and collaborate effectively in any role in multi-disciplinary teams.

PO9 : Recognize professional, social and ethical values imbibed in the business and technical environments.

PO10 : Engage in lifelong learning to be empowered with management expertise and by structured adoption of technological advancements.

PO11 : Aspire to be an intrapreneur/entrepreneur by transforming the idea into successful business venture with due consideration to financial, technical and management aspects.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTING

M.Sc. DECISION AND COMPUTING SCIENCES

Curriculum from the Academic Year 2017 - 2018 onwards

Semester I

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC11	Technical English	3	0	0	3	HS
17MDC12	Applied Algebra and Calculus	3	2	0	4	BS
17MDC13	Basic Statistical Methods	3	2	0	4	BS
17MDC14	Human Behavior	3	0	0	3	PC
17MDC15	Programming in C	3	0	0	3	PC
	PRACTICALS					
17MDC16	Computing Laboratory I (Algebra, Calculus and Statistics in SciLab and Excel)	0	0	4	2	PC
17MDC17	Programming Laboratory in C	0	0	4	2	PC
17MDC18	English Language Laboratory	0	0	2	1	EEC / HS
	Total Credits				**22**	

Semester II

Course Code	Course Name	L	T	P	C	Category
	THEORY					
	Language Elective	3	0	0	3	HS
17MDC21	Probability and Applications	3	2	0	4	BS
17MDC22	Principles of Management	4	0	0	4	PC
17MDC23	Web Technology	3	0	0	3	PC
17MDC24	Data Structures and Algorithms	3	0	0	3	PC
	PRACTICALS					
17MDC25	Computing Laboratory II (Probability in Excel and SciLab)	0	0	4	2	PC
17MDC26	Web Technology Laboratory	0	0	4	2	PC
17MDC27	Data Structures Laboratory using Python	0	0	4	2	PC
	Total Credits				**23**	

Semester III

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC31	Applied Statistics for Business Decisions	3	2	0	4	BS
17MDC32	Financial Analysis and Reporting	4	0	0	4	PC
17MDC33	Computer Systems	3	0	0	3	PC
17MDC34	Database Management Systems	3	0	0	3	PC
17MDC35	Object Oriented Programming	3	0	0	3	PC
	PRACTICALS					
17MDC36	Business Statistics Laboratory using R	0	0	4	2	PC
17MDC37	Business Database Design Laboratory	0	0	4	2	PC
17MDC38	Object Oriented Programming Laboratory using Java	0	0	4	2	PC
	Total Credits				**23**	

Semester IV

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC41	Predictive Analytics	3	0	0	3	BS
17MDC42	Operations Research for Business	3	2	0	4	BS
17MDC43	Corporate Finance	3	0	0	3	PC
17MDC44	Production and Operations Management	3	0	0	3	PC
17MDC45	Computer Networks	3	0	0	3	PC
	PRACTICALS					
17MDC46	Predictive Analytics Laboratory	0	0	4	2	PC
17MDC47	Business Process Optimization Laboratory (OR & POM)	0	0	4	2	PC
17MDC48	Financial Analysis Laboratory (Spreadsheets and Python)	0	0	4	2	PC
17MDC49	Managerial Communication Skills*					EEC
	Total Credits				**22**	

Semester V

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC51	Organisational Behavior	3	0	0	3	PC
17MDC52	Digital Marketing	3	0	0	3	PC
17MDC53	Software Engineering	3	0	0	3	PC
17MDC54	Enterprise Resource Planning	3	0	0	3	PC
	Elective I	3	0	0	3	PE
	PRACTICALS					
17MDC55	Human Resources System Development Laboratory (Python,R studio)	0	0	4	2	PC
17MDC56	Digital Marketing Design Laboratory (R Studio, Visualisation, Graphical)	0	0	4	2	PC
17MDC57	Enterprise Application Development Laboratory (J2EE)	0	0	4	2	PC
17MDC58	Personality Development*					EEC
	Total Credits				**21**	

Semester VI

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC61	Economic Foundations of Business	3	0	0	3	PC
17MDC62	Computational Intelligence	3	0	0	3	PC
17MDC63	Mobile and Cloud Computing	3	0	0	3	PC
17MDC64	Data Warehousing and Mining	3	0	0	3	PC
	Elective - II	3	0	0	3	PE
	PRACTICALS					
17MDC65	Mobile and Cloud Application Development Laboratory	0	0	4	2	PC
17MDC66	Data Mining Laboratory	0	0	4	2	PC
	Elective Laboratory - I	0	0	4	2	EEC
	Total Credits				**21**	

Semester VII

Course Code	Course Name	L	T	P	C	Category
17MDC71	Project Work and Viva Voce-I	0	0	0	18	EEC
	Total Credits				**18**	

Semester VIII

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC81	Modeling and Simulation	3	0	0	3	PC
17MDC82	Decision Support Systems	3	0	0	3	PC
17MDC83	Game Theory and Decision Analysis	3	0	0	3	PC
	Elective - III	3	0	0	3	PE
	Elective - IV	3	0	0	3	PE
	PRACTICALS					
17MDC84	Business Intelligence Laboratory	0	0	4	2	PC
17MDC85	Decision Analysis Laboratory (Game Theory)	0	0	4	2	EEC
17MDC86	Entrepreneurship Development*					EEC
	Elective - Laboratory II	0	0	4	2	PC
	Total Credits				**21**	

Semester IX

Course Code	Course Name	L	T	P	C	Category
	THEORY					
17MDC91	Principles of Information Security	3	0	0	3	PC
17MDC92	Project Management	3	0	0	3	PC
17MDC93	Human Computer Interface and Interaction	3	0	0	3	PC
	Elective - V	3	0	0	3	PE
	Elective - VI	3	0	0	3	PE
	PRACTICALS					
17MDC94	Human Computer Interface and Interaction Laboratory	0	0	4	2	PC
17MDC95	Minor Project - Decision Tool Development	0	0	8	4	EEC
17MDC96	Business Ethics *					EEC
	Total Credits				**21**	

Semester X

Course Code	Course Name	L	T	P	C	Category
17MDC101	Project Work and Viva Voce- II	0	0	0	18	EEC
	Total Credits				**18**	
	Grand Total of Credits				**210**	

*Pass is required

PROFESSIONAL ELECTIVES - THEORY COURSES

Course Code	Course Name	L	T	P	C	Category
	MANAGEMENT STREAM					
	Finance					
17MDCE01	Security Analysis and Portfolio Management	3	0	0	3	PE
17MDCE02	Equity Valuation	3	0	0	3	PE
17MDCE03	Derivatives and Risk Management	3	0	0	3	PE
17MDCE04	Credit Risk Analytics and Management	3	0	0	3	PE
	Marketing					
17MDCE11	Consumer Behavior	3	0	0	3	PE
17MDCE12	Services Marketing	3	0	0	3	PE
17MDCE13	Customer Relationship Management	3	0	0	3	PE
17MDCE14	Brand Management	3	0	0	3	PE
	Human Resources					
17MDCE21	Strategic Human Resource Management	3	0	0	3	PE
17MDCE22	Organisational Development	3	0	0	3	PE
17MDCE23	Performance Management	3	0	0	3	PE
17MDCE24	Compensation Management	3	0	0	3	PE
	Operations & Logistics					
17MDCE31	Total Quality Management	3	0	0	3	PE
17MDCE32	Logistics Strategy and Planning	3	0	0	3	PE
17MDCE33	Supply Chain Management	3	0	0	3	PE
17MDCE34	Warehouse and Distribution Management	3	0	0	3	PE
	General Management					
17MDCE41	Business Environment	3	0	0	3	PE
17MDCE42	Legal Aspects of Business	3	0	0	3	PE
17MDCE43	Information Technology for Managers	3	0	0	3	PE
17MDCE44	Direct and Indirect Tax	3	0	0	3	PE
17MDCE45	Technology and Innovation Management	3	0	0	3	PE
17MDCE46	Business Process Management	3	0	0	3	PE
	COMPUTER SCIENCE STREAM					
	Data Analytics					
15MSSE34	Machine Learning	3	0	0	3	PE
16MDSE53	Big Data Architecture	3	0	0	3	PE
16MDSE2	Web Mining	3	0	0	3	PE
16MDS83	Data Visualization	3	0	0	3	PE
16MDSE6	Information Security Analytics	3	0	0	3	PE
16MDSE20	Data Centric Computing	3	0	0	3	PE
16MDSE8	Bio-Informatics	3	0	0	3	PE
16MDSE3	Social Network Analysis	3	0	0	3	PE

PROFESSIONAL ELECTIVES - THEORY COURSES

Course Code	Course Name	L	T	P	C	Category
16MDSE4	Geographical Information Analysis	3	0	0	3	PE
16MDSE11	Econometric Analysis	3	0	0	3	PE
16MDS92	Deep Learning	3	0	0	3	PE
	Distributed and Network Systems					
15MSSE19	SOA and Web Services	3	0	0	3	PE
15MSSE35	BlockChain Technology	3	0	0	3	PE
15MSSE17	Internetworking Protocols	3	0	0	3	PE
17MDCE51	Distributed Systems	3	0	0	3	PE
	Software Systems					
15MSSE09	Graphics and Multimedia Technologies	3	0	0	3	PE
15MSS63	Software Testing and Quality Assurance	3	0	0	3	PE
16MDSE7	Image Processing	3	0	0	3	PE
15MSSE06	Software Requirements Engineering	3	0	0	3	PE
15MSSE07	Software Reliability	3	0	0	3	PE
15MSSE08	Open Source Software Development	3	0	0	3	PE
16MDSE25	Software Architecture and Design Patterns	3	0	0	3	PE
15MSSE24	Real Time Systems	3	0	0	3	PE
15MSSE25	Analysis and Design of Real Time Systems	3	0	0	3	PE
15MSSE27	Computer vision	3	0	0	3	PE
15MSSE14	Design Thinking	3	0	0	3	PE
15MSSE36	Advanced Web Technology	3	0	0	3	PE

PROFESSIONAL ELECTIVES - LABORATORY COURSES

Course Code	Course Name	L	T	P	C	Category
17MDCEL1	Minor Project in Business / Data Analytics	0	0	4	2	PE
17MDCEL2	Modeling and Simulation Laboratory	0	0	4	2	PE
15MSSL08	Image Processing Laboratory	0	0	4	2	PE
15MSSL03	Graphics and Multimedia Laboratory	0	0	4	2	PE
15MSSL13	Advanced Web Technology Laboratory	0	0	4	2	PE
16MDS55	Machine Learning Laboratory	0	0	4	2	PE
16MDS56	Big Data Modeling Laboratory	0	0	4	2	PE
16MDS85	Data Visualization Laboratory	0	0	4	2	PE
16MDS94	Deep Learning Laboratory	0	0	4	2	PE
15MSS65	Software Testing Laboratory	0	0	4	2	PE
16MDSEL2	Web Mining Laboratory	0	0	4	2	PE

LANGUAGE ELECTIVE

Course Code	Course Name	L	T	P	C	Category
16MDSLE01	Professional English	3	0	0	3	HS
16FY22F	Basic French	3	0	0	3	HS
16FY22G	Basic German	3	0	0	3	HS

* Pass is required

\# FC - Foundation Course, PC - Professional Core, PE - Professional Elective, EEC - Employability Enhancement Course.

NOTE :

- Equal weightage for Decision Science and Computer Science is given in the design of the curriculum, which complement each other to address the industry needs.
- Students of this Programme can specialize in Decision Science and/or Computing Science by choosing interested elective courses given under different streams.

17MDC11 - TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given a technical paragraph identify the topic sentence, infer meanings, lexical and contextual items, and find the supporting points and transitional tags*
- *Given a communication context, specify the barriers to listening and deduce solutions to overcome the barriers. Given short conversations and monologues for listening, specify appropriate responses and construct a summary.*
- *For a given topic, introduce ideas, give opinions and justify your stance. For a given topic, argue for or against the topic for 5 minutes. Plan and prepare a 15 minute presentation using visual aids and deliver a power point presentation for a given technical topic.*
- *For a given topic, write an argumentative, descriptive, biographical or autobiographical essay. Interpret the given technical graphical representation and compose passage. Summarize and paraphrase technical texts in about 200 to 300 words.*
- *Apply the rules of grammar viz, tenses prepositions, subject-verb agreement, adjectives, direct indirect speech and use appropriate patterns in a given sentence.*

FOCUS ON LANGUAGE

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

READING

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

WRITING

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

LISTENING

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

SPEAKING

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

TOTAL: 45

TEXT BOOK

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

EXTENSIVE READING

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

REFERENCE BOOKS

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

17MDC12- APPLIED ALGEBRA AND CALCULUS

L	T	P	C
3	2	0	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Familiar with the basic concepts in financial mathematics and application of numerical methods in solving equations occurring in business modeling.*
- *Able to understand and apply matrix methods to solve real world problems.*
- *Able to understand and apply differential calculus to solve optimization problems in Economics and Business.*
- *Able to understand and apply integral calculus to solve real world problems in economics and finance.*
- *Having good understanding of empirical modeling.*

ALGEBRA

SEQUENCES AND SERIES : Arithmetic, geometric and harmonic sequences-Finite and infinite series. Convergence and divergence of infinite series-Simple examples-nthterm test for divergence and p-series convergence. Applications of series in financial mathematics: Simple and Compound Interest-Nominal and Effective Interest Rates-Continuous Compounding -Future Value and Present Value-Annuities- Ordinary Annuity: Future and Present Value, Annuity Payment, Principal Sum, Period and Interest Rate, Annuity Due, Deferred Annuity and Perpetuity. **(6)**

SOLUTION OF EQUATIONS : Algebraic and transcendental equations - Bisection Method and Newton Raphson method-Real World Applications of Newton Raphson Method: Finding the Break Even Point of a Firm and finding the interest rates of Annuities. **(4)**

MATRICES AND VECTOR SPACES: MATRICES: 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. Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof)- Application to find the inverse and higher powers of a matrix - Diagonalization - Quadratic forms - Orthogonal reduction to Canonical form. Applications of Matrices: The Leontief Input Output Model in Economics, Leslie's Population Growth Model, Homogeneous Coordinates and their applications to Computer Graphics.

VECTOR SPACES: Vector spaces and Subspaces Linear dependence and independence of vectors- Linear transformations-Linearly independent sets and Bases-Dimension of a vector space **(14)**

CALCULUS

Differential Calculus : Definition of limit and derivative of a function. Applications to marginal analysis in Business and Economics, Relative Rate of Change and Elasticity of Demand- Maxima and Minima of function of single variables -Applications to Optimization of area and perimeter, Relation between Average Cost and Marginal Cost, Maximizing Revenue and Profit and Inventory Control. Functions of Several Variables-Partial Derivatives- Homogeneous functions and Euler's Theorem-Optimization of functions of two variables-Constrained Optimization using Lagrange Multipliers

Integral Calculus : Integration as a process of Summation-Application of Area between two curves to find the Net Excess Profit-Application to study Lorenz Curves in Economics-Calculation of present value of an income stream using definite integrals. **Special Functions:** Beta and Gamma Functions- Double and triple integrals - Applications: Area - Volume. **(13)**

EXPERIMENTAL DATA ANALYSIS : Curve fitting: Least Square Method. Interpolation: Newton's method - Lagrange's method. **Numerical Differentiation:** Application to Maxima and Minima of functions. **Numerical Integration:** Trapezoidal rule- Simpson's 1/3rd rule. Applications to real world problems and finding area, volume and Numerical Solutions of Ordinary Differential Equations: Taylor's Series - Runge Kutta Fourth order methods - Milne's Predictor - Corrector Method. **(8)**

TOTAL : 45

TEXT BOOKS

1. *Ahmad Nazri Wahidudin, "Financial Mathematics and Its Applications", Ventus Publishing ApS, ISBN 978-87-7681-928-6, 2011.*
2. *David C Lay "Linear Algebra and its Applications", Fourth edition Pearson 2012.*
3. *R.A.Barnett, M.R.Ziegler and K.E.Bylen, Calculus for Business, Economics, Life Sciences and Social Sciences, 12th Edition, Prentice Hall, 2011.*
4. *L.D.Hoffman and G.L.Bradley, Calculus for Business, Economics and the Social and Life Sciences, 10th Edition, McGraw Hill, Higher Education, 2010.*

REFERENCE BOOKS

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

17MDC13 - BASIC STATISTICAL METHODS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Achieve good skills in presentation and summarization of data using statistical tool*
- *Apply basic concepts in probability theory to data and derive useful measures for easy interpretation of the probability structure of data*
- *Gain knowledge in sampling and various methods of sampling from population data*
- *Understand the meaning of association between two variables and use regression analysis in prediction.*

DEFINITION OF STATISTICS

Data -Qualitative and quantitative - Measurement of data -Nominal and Ordinal - Raw data and grouped data - Primary and secondary data - Methods of collection -Classification of data - Tabulation -frequency distribution and various diagrammatic and graphical representations of data. **(7)**

SUMMARY STATISTICS

Measures of Central Tendency-arithmetic mean, median, mode, geometric mean and harmonic mean Merits and demerits-Relationship between mean, median and mode-Relationship AM, GM and HM, computation of the measures for grouped and ungrouped data-weighted arithmetic Measures of dispersion-range, mean deviation and standard deviation - coefficient of variation and its use- quartiles and inter quartile range-quintiles deciles and percentiles- moving averages -Skewness and Kurtosis and their uses. **(8)**

PROBABILITY

Deterministic and random experiments -Definition of sample space and events- classical and axiomatic definitions- Properties of probability- addition theorem- conditional probability and multiplication theorem of probability- Definition of independent events - Random variables and their probability distributions-Discrete and continuous random variables Probability mass function and cumulative distribution functions -definition - Mathematical expectation-mean and variance - Mean and variances of linear combination of random variables - Chebyshev's theorem- -Important discrete distributions-Discrete Uniform Distribution, Binomial, Poisson, -Continuous distributions: probability density functions and cumulative probability distributions-Normal distribution and its properties and applications. **(15)**

SAMPLING

Population and sample- sampling and its need -sampling vs complete enumeration -parameter and statistics-Probability sampling and -random sampling- simple random sampling, lottery method and random number table method- stratified random sampling-sampling distribution and standard error of a statistic. **(7)**

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-Rank Correlation-Spearman's Rank Correlation Coefficient **(8)**

TOTAL : 45

TEXT BOOK

1. *S.C. Gupta, " Fundamentals of Statistics", 7th and Enlarged Edition, Himalaya publishing, Delhi, 2014.*

REFERENCE BOOK

1. *D M Levine T C Krehbiel and M L Berensen, "Business Statistics: A First Course", Pearson Education, Delhi, India, 2003.*
2. *Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Probability and Statistics for Engineers and Scientists. (2002), 7th Edition, Pearson Education, Inc., Delhi, India*

17MDC14 - HUMAN BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Given an organizational environment, identify the importance of Human Behaviour and its impact.*
- *Engage in a comprehensive review of major theories and traits used in human personality psychology and apply them for given problem scenarios.*
- *Understand the role played by values and attitude in the workplace and analyze individual human behaviour in the workplace as influenced by Perception.*
- *Evaluate the role of motivation in determining employee behaviour in the organization, and apply the techniques to suggest tools of motivation for a given business environment.*
- *With solid understanding of human behaviour in the workplace from an individual, group and organizational. perspective, evaluate problem scenarios and suggest solutions to problems relating to motivation, personality, perception, values and attitude.*

UNDERSTANDING HHUMAN BEHAVIOUR

Understanding Human Behaviour - Classification of Human Behaviour - Nature of people in organization - Models of Human Behaviour : Psychoanalytic Model, Existential Model, Behavioristic Model,Cognitive Model - Implications of Human Behaviour on the organization - Case Study **(9)**

PERSONALITY

Personality - Determinants: Heredity and environmental linkage - Development Approach: Argyris's Maturity-Immaturity Continuum - Personality Traits: Social Traits, Personal Conception Traits, Emotional Adjustment Traits - Personality Theories : Erikson's eight life stages, Passages Theory, Maturation Theory - Case Study **(9)**

VALUES AND ATTITUDES

Values: Sources - Types of Values - Allport's six value categories - Patterns and trends in values. Attitudes: Cognitive Component - Affective Component - Behaviour Component -Attitudes and Behaviour - Attitudes and Cognitive consistency. Socialisation influence on Personality Values and Attitudes - Case Study **(9)**

PERCEPTION

Perception - Perception Process - Factors influencing perception process - Stages of the Perceptual Process - Response to Perceptual Process - Perceptual distortion: Stereotypes or Prototypes, Halo Effects, Selective Perception, Projection, Contrast Effects, Self-fulfilling Prophecy - Managing perceptual process - Attribution theory - Case Study **(9)**

MOTIVATION

Motivation - Reinforcement, Content and Process Theories- - Classical and Operant conditioning - Reinforcement Strategies - Theories of Motivation : Hierarchy of Need theory, ERG theory, Acquired Needs theory, Two Factor Theory, Equity Theory, Expectation Theory - Case Study **(9)**

TOTAL : 45

TEXT BOOK

1. *John .R. Schermerhorn, James. G. Hunt and Richard. N. Osorn, 'Organizational Behaviour', Wiley Publication, 7th Edition.*

REFERENCE BOOKS

1. *B. Narayan and Bharati Sharma, "Behavioral Science in Management" Omsons Publications, New Delhi, 1993.*
2. *Harlow/Hamke, Behaviour in Organizations Text, Readings and Cases, Little, Brown and Company, 1975.*

3. *Stephen P. Robbins, Organizational Behaviour, Concepts, Controversies and Applications, Prentice Hall of India Private Limited, New Delhi, 1985.*
4. *K. Aswathappa, Organizational Behaviour Text, Cases and Games Himalaya Publishing House, Mumbai, Sixth Edition, 2005.*
5. *J. W. Newstrom, Organizational Behaviour Human Behaviour at Work, Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition, 2007.*

17MDC15 - PROGRAMMING IN C

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

Introduction to Computers-Computer Characteristics- Hardware vs Software- Developing a Program- Software Development Life Cycle- Structured Programming- Modes of Operation- Types of Programming Languages- Introduction to C- Desirable Program Characteristics **(6)**

BASIC CONSTRUCTS

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

FUNCTIONS AND STORAGE CLASSES

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

Storage classes - Automatic, External and Static Variables - Multifile Programs.

FUNCTIONS AND STORAGE CLASSES

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

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

ARRAYS, STRINGS AND POINTERS

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

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

Pointer Fundamentals - Declarations - Passing Pointers - Pointers and Arrays - Dynamic Memory Allocation - Operations on Pointers - Arrays of Pointers. **(14)**

STRUCTURES AND UNIONS, FILE HANDLING

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

Data File Handling - Binary File Handling - Random Access. **(11)**

TOTAL : 45

TEXT BOOKS

1. *Schaum's outline series, "Programming with C", Tata McGraw Hill Publication, 2nd Edition, 2010.*

REFERENCE BOOKS

1. *Herbert Schildt, "C- The Complete Reference", McGraw Hill, 4th edition, 2009.*
2. *Kernighan B.W. and Ritchie D.M., "C Programming Language (ANSI C)", Pearson Education, 2004.*

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.*
5. *Yaswanth Kanithkar, "Let Us C", Pearson edition,*

17MDC16 - COMPUTING LABORATORY I

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Be able to learn SciLab programming to perform problems in matrix algebra.*
- *Gain knowledge in writing script files in SciLab to perform numerical interpolation.*
- *Be able to develop skill in MS-Excel for diagrammatic representation and summarization of data.*
- *Be able to understand probability distributions and bivariate data analysis using MS-Excel programs*

CONCEPTS TO BE COVERED

1. SciLab Fundamentals
2. Algebraic operations on matrices, Transpose of a matrix, Determinants, inverse of a matrix,
3. Solving System of linear equations and consistency,
4. Row reduced echelon form and normal form.
5. Eigen values, Eigen vectors, Rank of a matrix.
6. Solving algebraic and system of equations.
7. Estimating numerical values for given data by means of interpolation
8. Perform data manipulation and financial functions using excel
9. Perform graphical and diagrammatic representation of statistical data, like bar diagram, pie, histogram and line diagram
10. Construct the pivotal tables and apply statistical functions to calculate the descriptive statistics
11. Practice the theory behind the descriptive statistics, like measures of central tendency, dispersion, skewness and kurtosis
12. Apply and Implement the theory of probability in various applications
13. Simple probability and random sampling
14. Practicing the simple correlation and regression techniques.

17MDC17 - PROGRAMMING LABORATORY IN C

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

CONCEPTS TO BE COVERED

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

17MDC18 - ENGLISH LANGUAGE LABORATORY

L	T	P	C
0	0	2	1

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

LIST OF EXPERIMENTS:

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

16MDSLE01 - PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

FOCUS ON LANGUAGE

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

READING

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

WRITING

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

LISTENING

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

SPEAKING

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

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOKS

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

16FY22G - BASIC GERMAN

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

EINFUHRUNG

BegrUung - Name - Vorname - Familienname - Anrede **(7)**

THEMA

Hallo !Wiegeht's?
Begegnungen
Guten Tag, ichsuche…,
ImSupermarkt
Arbeit und Freizeit
Familie und Haushalt **(10)**

GRAMMATIK-I

Position des Verbs :Aussage, W - Frage und
Ja/Nein - Frage; Artikel die der das.
W - Frage; Konjugation in Prasens;
Nominativ :bestimmter, unbestimmter und negative Artikel
Akkusativ :unbestimmterundnegativerArtikel
Adjektive :Akkusativ-Erganzung **(18)**

GRAMMATIK-II

ArtikelalsPronomen
Dative - Erganzung :Personalpronomen und Ortsangaben;
Imperativ
Modalverben; Ortsangaben; Richtungsangaben;
Zeitangaben; Ordinalzahlen
Possessiv - Artikel; trennbare und nichttrennbareVerben;
Wechselprapositionen **(10)**

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOK

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

16FY22 F - BASIC FRENCH

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Comprehend the fundamentals and Grammatical Patterns of French Language.*
- *Acquire the basic Writing and Speaking Skills.*
- *Develop an understanding of French practices and perspectives.*

INTRODUCTION:

UNITÉ-1: Faire connaissance - inviter et répondre à une invitation - décrire les personnes- articles définis et indéfinis - genre etnombre des noms et des adjectifs- interrogation et négation - conjugaison du présent. Paris monuments et lieux publics - la vie de quatreparisiens de professions différentes. **(12)**

UNITÉ-2 : Exprimer l' ordre et l'obligation demander et commander - evaluer et apprécier- féliciter et remercier - articles partitifs -adjectifsdémonstratifs et possessifsprépositions et adverbes de quantité et de l'imperatifverbespronominaux - unerégiondeFrance la Bourgogne - vie quotidienne à la compagne. **(12)**

UNITÉ-3 : Raconter et rapporter - donner son avis - se plaindre et réprimander - expliquer et justifier - pronomscompléments - futurproche - passé composé et imparfait. Plusieursrégions de France - différentsuniverssociaux. **(11)**

UNITÉ-4 : Demander l'autorisation - interdire - formuler des projects - discuter et débattre. Pronoms<en> et < y > - pronomsrelatifs et superlatifs - conjugaison du futur - présentcontinu et passé récent.La vie administrative et régionale - problems economiques et écologiques - traditions et modernité. **(10)**

Total : 45

TEXT BOOK :

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

REFERENCE BOOKS :

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

17MDC21 - PROBABILITY AND APPLICATIONS

L	T	P	C
3	2	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply various discrete and continuous probability distributions to data and derive useful inferences.*
- *Apply moment generating functions in understanding various properties of random variables*
- *Get good understanding of properties of estimators of population parameters*
- *Become familiar with various methods in statistical inference and he can independently apply many statistical tests to make inferences on the properties of both discrete and continuous types of data*
- *Get a basic knowledge on Bayesian inference.*

PROBABILITY DISTRIBUTIONS

Discrete: Geometric, Negative binomial distributions and Hypergeometric distributions. Continuous: uniform, exponential, gamma, Beta, Chi-square log normal distributions and Weibull distributions and their properties. **(8)**

FUNCTIONS OF RANDOM VARIABLES

Moments and Moment Generating functions of important distributions-Transformations of Variables and finding their distributions -method of direct transformation and method of moment generating functions- - Joint and Marginal Probability mass functions(for discrete) and density functions(for continuous). Conditional probability distributions-conditional mean and variance-Independence of random variables. **(15)**

ESTIMATION

Estimation of parameters using method of moments-Maximum Likelihood Point Estimation(MLE) -Properties of estimators-Unbiasedness, minimum variance, efficience and sufficience-Mean Square Error-Asymptotic properties-consistency-Fisher Information and Cramer-Rao's Inequality - Interval Estimation. **(7)**

SAMPLING AND TESTS OF HYPOTHESIS

Derivation of sampling distribution of mean and S2- t-distribution and F-distribution-Central limit theorems- Test of significance - Basic concepts - null hypothesis - alternative hypothesis - 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, tests foe homogeneity. **(10)**

INTRODUCTION TO BAYESIAN ESTIMATION

Baye's Theorem and its applications -Prior and posterior distributions-Optimal Decisions using loss function--Estimation: Bayesian versus classical- Simple applications **(5)**

Total : 45

TEXT BOOK

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.*

REFERENCE BOOKS

1. *S.C.Gupta and V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, 10th Revised Edition, New Delhi, 2002.*
2. *S.C. Gupta,"Fundamentals of Statistics", 7th and Enlarged Edition, Himalaya publishing, Delhi, 2014.*
3. *Anthony O'Hagan, Bryan R. Luce, "A primer on Bayesian Statistics in Health Economics and Outcomes Research", MEDTAP International Inc, 2003.*

17MDC22 - PRINCIPLES OF MANAGEMENT

L	T	P	C
4	0	0	4

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand and appreciate the necessity and importance of effective management for the success of any activity*
- *Apply the planning, organizing and control processes to solve problems in a given business scenario*
- *Apply the techniques learnt in process of staffing, performance appraisal and training and identify solutions for a problem scenario*
- *Describe various theories related to the management in general and understand the management decision making process in particular.*
- *Gather and analyze both qualitative and quantitative information from a business scenario, to isolate issues and formulate best control methods.*

INTRODUCTION TO MANAGEMENT

Management - Evolution of Management Thought - Approaches to Management - Management in a Global Scenario - Social Responsibility of Managers - Ethics in Managing - Functions of Managers. Case Study. **(10)**

PLANNING

Planning - Types - Steps - Objectives - Strategic Planning Process - Core Competency - Kinds of Strategies and Policies - Forecasting - Rational Decision Making. Case Study. **(10)**

ORGANIZING

Formal and Informal Organization - Structure and Process of Organizing - Span of Management - Reengineering -Organization Structure - Departmentation - Authority - Decentralization - Delegation - Line and Staff - Organizational Effectiveness. Case Study. **(10)**

STAFFING

Staffing - Definition - HRM - Job Analysis - Organizational Culture - Staff Life Cycle - Selection - Performance Appraisal - Rewards - Learning and Development - Change Management - Organization Development - The Learning Organization Case Study. **(10)**

DIRECTING

Motivation - Theories of Motivation - Job Enrichment - Leadership - Definition -Approaches - Styles. Groups, Committees and Teams - Group Decision Making. Communication - Process - Flow of Communication in Organization - Barriers to Communication, Case Study **(10)**

CONTROLLING

Control Process - Feedback and Feedforward - Financial Control - Budgeting - Metrics - Balanced Scorecard - Analytics - Information Systems - Productivity - Quality Control, Case Study **(10)**

Total : 60

TEXT BOOK :

1. *Harold Koontz, Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 9th Edition, 2007.*

REFERENCES :

1. *Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, 9th edition, 2012.*
2. *Samuel C. Certo and TervisCerto, Modern management: concepts and skills, Pearson Education, 12th edition, 2012.*
3. *Stephen P. Robbins and Mary Coulter, Management, Prentice Hall of India, 10th edition*
4. *Harold Koontz and Heinz Weihrich, Essentials of management: An International & Leadership Perspective, 9th edition, Tata McGraw-Hill Education, 2012.*
5. *Charles W.L Hill and Steven L McShane, 'Principles of Management, McGraw Hill Education, Special Indian Edition, 2007.*
6. *J.N.Chandan, Management Theory & Practice*
7. *K.Aswathapa, Essential of Business Administration, Himalaya Publishing House*

17MDC23 - WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

History of Internet and World Wide Web - W3C - Web Browser Basics - Internet Accounts - shell, PPP, SLIP. Web Server: HTTP Transactions - Multitier Application Architecture - Client and Server side Scripting - Accessing web server - server types - Requesting document under web. **(7)**

HTML

Basic HTML Tags - contents of header section - page formatting tags, text formatting tags -Links - Lists - Image - Tables - Complex tables - Frames - Nested frames - Forms. **(7)**

XHTML and CSS

Introduction to XHTML - Difference between HTML and XHTML - Headings - Linking - Images - Lists - Tables - Forms - Meta elements. CSS : Inline, Embedded, External Style sheets - Positioning - Backgrounds - Element Dimensions - Box model and Text flow **(7)**

JAVA Script & DHTML

Introduction- Memory Concepts, Arithmetic, Decision Making, Control Structures - Functions - Arrays - Objects - Math, String, Date, Boolean and Number. DHTML: Object Model and Collections - Event Models - Filters and Transitions **(8)**

XML

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

PHP

Introduction - PHP basics- String processing and Regular expressions - Form Processing and Business logic - Connecting to a database - Cookies - Dynamic content. **(8)**

Total : 45

TEXT BOOKS

1. *P.J. Deitel, H.M Deitel, "Internet and World Wide Web How To Program", 4th edition, Pearson Education, 2011. (Para I - V)*
2. *Margaret Levine Young, "Internet: The Complete Reference", Millenium Edition. (Para I)*

REFERENCE BOOKS

1. *Christopher Schmitt, "CSS Cookbook", Third Edition, 2009.*
2. *Vikram Vaswani "PHP Programming Solutions", Tata McGraw-Hill, 2007.*

17MDC24 - DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC15

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION TO DATA STRUCTURES

Primitive data structures - ADT- Arrays: Arrays as ADT, one dimensional array, two dimensional array, multidimensional array, representation-sparse matrix. **(6)**

STACK

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

Recursion: Definition, properties, examples.

QUEUE

Definition - queue as ADT, sequential representation - operations - circular queue - priority queue. Applications: Categorizing data and Queue Simulation **(11)**

LINKED LISTS

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

TREES

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

ALGORITHMS

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

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

Total : 45

TEXT BOOKS

1. *Yedidyah Langsam, Moshe.J.Augenstein, Aaron.M.Tenenbaum, "Data structures using C & C++", PHI Publications, 2nd Edition, 2006. (Para I - Para IV)*
2. *Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivert, Clifford Stein, "Introduction to Algorithms", PHI Publications, 2nd Edition, 2004.(Para V)*

REFERENCE BOOKS

1. *Ellis Horowitz & Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Publications, 1983.*
2. *Richard F. Gilbery, Behrouz A.Forouzan, "Data structures - A Pseudo code Approach with C", Thomson Asia Pvt. Ltd, 2002.*
3. *Krishnamoorthy.R, "Data Structures using C", Mc Graw-Hill Education (India) Pvt. Ltd, 2010.*

17MDC25 - COMPUTING LABORATORY II

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Will be able to apply various techniques of integration in finding line integrals and double integrals.*
- *Will be able to solve differential equations using SciLab.*
- *Able to understand various probability distributions and their properties using programs in SciLab and MS-Excel*

CONCEPTS TO BE COVERED

Implement the following using SCI Lab and MS-Excel

1. Extreme Value of functions-finding local extrema
2. Numerical differentiation based on Newton's formula, Lagrange's formula.
3. Functions of several variables--Hessian matrix-Expansions and extreme values- Constrained extrema using Lagrange's multiplier method-applications
4. Numerical integration-Trapezoidal and Simpson's 1/3 rules.
5. Solution of Ordinary Differential Equations,
6. Discrete and Continuous probability distributions
7. Joint Probability Distributions
8. Estimation of population parameters
9. Statistical Hypothesis testing- Large Sample tests
10. Statistical Hypothesis testing - Small Sample tests
11. Bayesian Data Analysis

TEXT BOOKS/REFERENCES

1. *K.N.Berk and P.Carey, Data Analysis with Microsoft Excel, Brooks/Cole, USA,2010*
2. *Gilberto E.Urroz, Matrices and Linear Algebra with SCILAB, http://www.tf.uns.ac.rs/~omorr/radovan_omorjan_003_prII/s_examples/Scilab/Gilberto/scilab5a.pdf*
3. *Graeme Chandler and Stephen Roberts, Scilab Tutorials for Computational Science, http://paginapessoal.utfpr.edu.br/previero/calculo-numerico-ma64a-em41-e-em42/informacoes-da-disciplina/Scilab_Tutorials.pdf*

17MDC26 - WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC23

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

CONCEPTS TO BE COVERED

1. HTML programs with basic tags, formatting tags, tables, images, lists and frames
2. Interactive pages using anchors, image maps and forms
3. XHTML representation of web pages.
4. Cascading Style Sheets - Dynamic properties for individual, group and random elements
5. JScript Programs for Simple Arithmetic, String processing, Arrays, built in and user defined functions, client side validations
6. XML - Database, DTD, XSD, XSL representation
7. PHP - simple programs for embedding html and php, Arrays, String Processing
8. Server side Validations, Cookies, Database Connectivity.

17MDC27- DATA STRUCTURES LABORATORY USING PYTHON

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC15

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

CONCEPTS TO BE COVERED

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

17MDC31 - APPLIED STATISTICS FOR BUSINESS DECISIONS

L	T	P	C
3	2	0	4

PRE-REQUISITES
17MDC13, 17MDC21

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply and compute using Various Index Numbers used in Economics and Business*
- *Apply Statistical methods and Decision Analysis tools to analyze data from time series and Business.*
- *Prepare Control Charts for variables and attributes using data from economics*
- *Analyze Data from Statistical Experiments using appropriate Statistical Design of Experiment like CRD,RBD,LSDetc*
- *Analyze Data using Non-parametric methods*

INDEX NUMBERS

Definition, characteristics and uses of Index Numbers-Types of Index Numbers-Price, quantity and value indices- Simple and weighted aggregate index numbers -Laspeyre, Paasche,, Marshell - Edgeworth, Fisher's Ideal Index Numbers-Tests of adequacy of Index Numbers. **(9)**

Time Series and Forecasting : Definition- Time Series. Components- -Time series decomposition models: multiplicative and additive models -Forecasting error-measurement using Mean Absolute Deviation(MAD), Mean Absolute Percentage Error (MAPE), Mean Squared Error(MSE) and Root Mean Square Error (RMSE)- Smoothing Techniques: Naïve forecasting, moving averages and weighted moving averages-Exponential smoothing -Simple and double Exponential Smoothing- Trend analysis- linear, quadratic and exponential trend-Seasonal Effects-Decomposition methods: method of simple averages, ratio to trend method and ratio to moving average method-Measurement of cyclic and irregular variations. **(11)**

Statistical Quality Control : Nature of Control Limits-Purpose of Control Charts-Control Charts for Variables-Control Charts for Attributes-Cusum Control Charts. **(6)**

Decision Analysis : Decision making under certainty: Analytic Hierarchy Process- Decision making under risk: Expected value criteria, Expected value of perfect information - Decision making under uncertainty. **(6)**

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. **(7)**

Non Parametric Statistics : Introduction toNonparametric tests -Sign test - Signed Rank test-Rank-Sum test-Wilcoxon-Mann-Whitmey test (U test), Kruskal Wallis test-Runs test-Spearman's Rank correlation coefficient. **(6)**

TOTAL : 45

TEXT BOOKS

1. *Ken Black, "Business Statistics for Contemporary Decision Making", 6th Edition, John Wiley &Sons.Inc, 2010 [Para 1,2,3 and 5]*
2. *Richard I. Levin, David S. Rubin, "Statistics for Management", 7th Edition Pearson Education, 2011.[Para 2 and Para 4]*
3. *Ronald E.Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Prentice Hall, 2012 (Para 3, 5 and 6)*

REFERENCE BOOKS

1. *R.P.Hooda, "Statistics for Business and Economics", 5th Edition, Vikas Publishing House Pvt. Ltd., Noida, 2013.*
2. *D M Levine, M L Berensen, T C Krehbiel and P.K.Viswanathan- "Business Statistics: A First Course", 5th Edition, Pearson Education, Delhi, India, 2011*
3. *Dinesh Kumar U. "Business Analytics", Wiley, First Edition, 2017*

17MDC32 - FINANCIAL ANALYSIS AND REPORTING

L	T	P	C
4	0	0	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the Procedures of the accounting system.*
- *Prepare financial statements and analyse its linkages.*
- *Evaluate the financial statements and annual reports*
- *Analyse the impact of working capital on the business*
- *Identify the inferior quality of financial reporting*

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. **(15)**

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. **(8)**

Annual Report Analysis : Reading an annual report for a listed entity - Parts of Annual Reports - Financial Highlights - Directors' Report - Management Discussion and Analysis - Standalone and Consolidated Financial Statements- Notes to Financial Statements- Related Party Transactions. **(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. **(20)**

Quality of Financial Reporting : Measuring Quality of Earnings - Identifying the potential red flag. Costing: Concepts of Cost - Elements of Cost - Classification of cost - Preparation of Cost Sheet **(10)**

TOTAL : 60

REFERENCE BOOKS

1. *Jain and Narang, "Accounting for Managers", Kalyani Publishers, 2006*
2. *Horngren, Sundem, Elliot, "Introduction to Financial Accounting", Pearson Education, 2005*
3. *Maheshwari.S.N, "An Introduction of Accounting", Vikas Publishig House Pvt Limited 2005.*
4. *Narayanaswamy, "Financial Accounting:A Managerial Perspective", PHI Learning Pvt Ltd, 2008.*
5. *Thomas .R. Robinsn and et.al, "International Financial Statement Analysis", John Weily& Sons, Inc, 2009.*

17MDC33 - COMPUTER SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC24

ASSESSMENT : THEORY

COURSE OUTCOME

The student will be able to

- *Demonstrate the basics of computer systems and Operating systems.*
- *Demonstrate Kernel Management for Inter Process Communication systems.*
- *Estimate the system performance through scheduling algorithms - FIFO, round robin, priority, shortest job first.*
- *Recognize the memory allocation and deallocation for both static and dynamic storage.*
- *Discuss the simple File System using Disk and File System Management of Windows Operating System.*

COMPUTER SYSTEMS OVERVIEW

Basic elements, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization.

INTRODUCTION TO OPERATING SYSTEM

Operating System Objectives and Functions, The Evolution of Operating Systems. **(8)**

PROCESS DESCRIPTION AND CONTROL

Process states, Process description, Process control, Processes and threads, Types of Threads.

CONCURRENCY

Principles of Concurrency, Mutual Exclusion: Hardware support, Semaphores, Monitors.

Deadlock and Starvation: Principles of Deadlock, deadlock prevention, deadlock avoidance, deadlock detection. Windows 7 Concurrency Mechanisms. **(10)**

MEMORY MANAGEMENT

Memory management requirements, Memory partitioning, Paging, Segmentation.

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

UNIPROCESSOR SCHEDULING

Types of Processor Scheduling, Scheduling 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, Windows I/O.

File Management : Overview, File Organization and Access, File directories, File sharing, Secondary Storage Management, Windows file system. **(9)**

Total : 45

TEXT BOOKS

1. *William Stallings, "Operating systems Internals and Design Principles", 7th edition, PHI, 2016. (Note: Para I: Computer Systems Overview - refer Online edition)*

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., Peterson J.L and Galvin P., "Operating System Concepts", John Wiley Publishing Company, 2002.*
3. *H.M.Deital, "An introduction to Operating System", Pearson Education, 2001*

17MDC34 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC15, 17MDC24

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

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

DATABASE DESIGN

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

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

INTRODUCTION TO SQL

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

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization. **(11)**

Advanced SQL : Accessing SQL from a Programming Language, Functions and Procedures, Triggers.

Formal Relational Query Languages: The Relational Algebra. **(7)**

TRANSACTION, CONCURRENCY CONTROL AND RECOVERY

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

Total : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

17MDC35 - OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC15

ASSESSMENT : THEORY

COURSE OUTCOME

- *Students can develop applications in Java using Basic Windows, Swing Framework, Multi threaded Applications and Database Connectivity*
- *Students can learn to apply the Object Oriented Concepts in Java Programming for real world problems.*
- *Students can develop UI using Applets and Swing components.*
- *Students can learn to develop data structures using Collections.*
- *Students will be able to logically group classes and interfaces in one place using inner classes and interfaces.*

INTRODUCTION

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

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

BASICS

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

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

USER INTERFACE COMPONENTS WITH SWING

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

APPLETS

Types of Applets- Applet Basics - The applet Class - Applet Architecture - An applet Skeleton- Applet Initialization and Termination - Display Methods- Requesting Repainting - Using the Status Window - Passing parameters - Applet Context and Show document **(10)**

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

MULTITHREADING - Threads - Interrupting Threads - Thread states.

Database Connectivity : JDBC **(9)**

Total : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

17MDC36 - BUSINESS STATISTICS LABORATORY USING R

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC16, 17MDC25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To develop skills in analyzing data using R software package*
- *To compute various Index Numbers used in Economics using R software*
- *To analyze time series data using R software*
- *To develop Shewhart Control charts for variables and attributes using qcc package of R*
- *To analyze data on Statistical Designs of Experiment like CRD, RBD, LSD using R software*
- *To analyze data with non-parametric methods using R software*

CONCEPTS TO BE COVERED :

1. Creating Data sets in R: Data Structures-Vectors-Matrices-Arrays-Data frames-factors-Lists
2. Reading and Writing Data-read. Table, read. Csv - Subsetting a vector - Subsetting a Matrix
3. Basic Graphs-Bar, Pie Charts-Histograms-Box Plots
4. Basic Statistics-Descriptive Statistics-Frequency and Contingency Tables-Correlations and t-tests
5. Regression Analysis
6. Computing Simple and weighted aggregate index numbers -Laspeyre and Paasche Index Numbers
7. Computing Marshell - Edgeworth, Fisher's Ideal Index Numbers
8. Time-Series Data-Reading and Plotting Time Series Data
9. Decomposing Time Series Data-Decomposing Non-seasonal and Seasonal Data-Seasonally Adjusting
10. Forecasts Using Exponential Smoothing
11. Trend Analysis-Fitting linear trend
12. Trend Analysis-Fitting quadratic and exponential trends
13. Control Charts Using qcc package
14. Shewhart quality control charts for variables: xbar, R and S charts
15. Control Charts for attributes: p, np and c charts using qcc package
16. Cusum charts using qcc package
17. One way ANOVA
18. Non-parametric tests using R: Sign test,Wilcoxon Signed Rank test
19. Non-parametric tests: Mann-Whitney-Wilcoxon test
20. Kruskal Wallis test-Runs test-Spearman's Rank correlation coefficient

TEXT BOOKS

1. *Robert I.Kabacoff, "R IN ACTION:Data Analysis and Graphics with R",Manning Publications Co.,2011*
2. *R.D.Peng, "R Programming for Data Science", Leanpub, 2015*

REFERENCE BOOKS / INTERNET RESOURCES

1. *J.Maindonald and W.John Braun, "Data Analysis and Graphics Using R-an Example Based Approach", 3rd Edition, Cambridge University Press, 2010*
2. *M.Logan, "Biological Design and Analysis Using R: A Practical Guide", Wiley-Blackwell, 2010*
3. *A. Coghlan, "A Little Book of R for Time Series Analysis", Release 0.2, 2015,http://www.calvin.edu/~stob/courses/m344/*S15/a-little-book-of-r-for-time-series.pdf

17MDC37 - BUSINESS DATABASE DESIGN LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

CONCEPTS TO BE COVERED

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

Databases for the above Concepts are to be given from Business Applications like:

- Financial Accounting
- Marketing
- Sales
- Operations Management
- Human Resource Management Applications
- Customer Relations Management
- Supply Chain Management
- Collaborative Workforce management software
- Social Networking Applications

17MDC38 - OBJECT ORIENTED PROGRAMMING LABORATORY USING JAVA

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC15, 17MDC17

ASSESSMENT : PRACTICAL

COURSE OUTCOME

Students can develop applications in Java using

- *Basic Windows*
- *Swing Framework*
- *Multi threaded Applications*
- *Database Connectivity*
- *Collections*

CONCEPTS TO BE COVERED

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

17MDC41 - PREDICTIVE ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC13, 17MDC21

ASSESSMENT : THEORY

COURSE OUTCOME

- *Analyze time series data and to use it for forecasting.*
- *Formulate and compute multiple linear regression model and understand its properties*
- *Classify objects into different groups using discriminant function, logistic regression equation and cluster analysis techniques*
- *Identify underlying factors in multivariate data sets using principal component analysis and factor analysis.*

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 R2-Standardized Regression Coefficient and its interpretation-Inclusion of categorical or indicator variables in MLR -Multi-collinearity problem-Stepwise Regression. **(10)**

Time Series Forecasting : Regression Model for forecasting-Forecasting Time Series data with Seasonal Variation-Auto-Regressive(AR) Models- AR Model Identification: ACF and PACF, Moving Average -MA(q)) and ARMA(p,q) Models-Auto-Regressive Integrated Moving Average (ARIMA) Process-Dickey Fuller Test-Augmented Dickey-Fuller Test-Transforming Non Stationary Process to Stationary Process using Differencing-ARIMA(p,d,q) model building-Ljung-box test for Auto-Correlations-Power of Forecasting: Theil's Coefficient. **(12)**

Discrimination and Classification : Discriminant Function Analysis- Fisher's discriminant function -Fitting discriminant functions using R and interpreting the results. Logistic Regression:Logistic Model-Definitions of Odds and Logit-Estimation of the logistic regression coefficients-Making Predictions-Multiple Logistic Regression-Fitting logistic regression equation using R and interpreting the results. **(9)**

Principal Component Analysis and Factor Analysis : DataReduction 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 using R. **(7)**

Clustering - Introduction-Distance and Similarity Measures used in clustering-Euclidean distance-standardized educlidean distance-Manhattan distance-Minkowski Distance-Jaccard Index-Cosine Similarity and Gower's Similarity-Quality and Optimal Number of Clusters-K-Means Clustering and Hierarchical Clustering Methods -Cluster Analysis Using R and other Software Packages-Applications. **(7)**

Total : 45

TEXT BOOKS

1. *Dinesh Kumar U, " Business Analytics", Wiley, First Edition, 2017 [Para 2,Para3, Para 5]*
2. *Alvin C.Rencher,"Methods of Multivariate Analysis", 2nd Edition, Wiley Inter-science, 2002 [Para 1]*
3. *Richard A.Johnsonand Dean W.Wichern, " Applied Multivariate Statistical Analysis", 6th Edition, Pearson Prentice Hall, 2007[Para 3 and Para 4]*

REFERENCE BOOKS

1. *R.E.Walpole,R.H.Myers,S.L.Myers and K.Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Prentice Hal, 2012*
2. *Joseph F. Hair Jr., William C. Black, Barry J.Babin and RolphE.Anderson, "Multivariate Data Analysis", 7th Edition, Pearson, 2010.*
3. *G.James,D.Witten, T.Hastie and R.Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2015.*

17MDC42 - OPERATIONS RESEARCH FOR BUSINESS

L	T	P	C
3	2	0	4

PRE-REQUISITES
17MDC12

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design the optimal model to improve the efficiency and productivity of any organization using the concepts of mathematical modeling of decision problems,*
- *Design of optimization techniques to solve the mathematical models*
- *Analyze any decision situation and offer solutions for the best utilization of limited resources*

LINEAR PROGRAMMING

Linear programming problem - Formulation - Graphical solution - Simplex method.

Duality and sensitivity analysis - Primal-dual relationships - Economic Interpretation of Duality - Dual Simplex Method - Post Optimal Analysis - Generalized Simplex Algorithm. **(16)**

Applications of Linear Programming : Transportation Model - Vogels Approximation method - Assignment model - Hungarian technique - Degeneracy-unbalanced problems. **(8)**

INTEGER PROGRAMMING

Construction of Gomory's Constraints - Fractional Cut method - Branch and Bound method - Applications. **(6)**

DYNAMIC PROGRAMMING

Characteristics of Dynamic Programming - Recursive nature of computation in Dynamic Programming - Forward and Backward Recursion - Applications: Shortest Route problem - Cargo loading problem - Resource allocation problem - Investment and Budgeting Problems - Reduction of Dimentionality **(8)**

SEQUENCING AND REPLACEMENT

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

Replacement - Need for replacement of equipments - Failure mechanism of items.

Replacement policy - Replacement of items that deteriorates gradually - Replacement of items that fail suddenly. **(8)**

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 EOQ model - ABC analysis. **(8)**

QUEUING THEORY

Characteristics of queuing systems, steady state M/M/1 model. **(6)**

Total : 60

TEXT BOOKS

1. *Frank R.Giordano, Maurice D.Weir and William P.Fox. Mathematical Modeling, Thomson Brooks/Cole, Vikas Publishing House Pvt Ltd., New Delhi.[Para 1]*
2. *Frederick S.Hiller, Gerald J.Leberman, Bodhibrata Nag and PreetamBasu, "Introduction to Operations Research", Ninth Edition, McGraw Hill, 2010.*
3. *Hamdy A.Taha, "Operations Research - An Introduction", Eighth Edition, 2010.*

REFERENCE BOOKS

1. *S. D. Sharma "Operations Research ", KedarNath ram Nath& co publishers, 10th edition, 1995.*
2. *KantiSwarup, P.K. Gupta, Mani Mohan, "Operations Research", Sultan Chand & Sons, 2001.*
3. *Hillier & Lieberman, "Operations Research - An Introduction", Tata McGrawHill, 2004.*
4. *Billey E. Gillett, "Introduction to Operations Research - A Computer Oriented Algorithmic Approach", Edition 1979.*
5. *U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", Wiley India, 2017*

17MDC43 - CORPORATE FINANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the time value of money and risk return calculation and its importance in financial decisions*
- *Analyse the various sources available for getting funds for the business and the cost involved in it.*
- *Evaluate the investment options available and select the best alternative for investments*
- *Decide the proportion of capital for business and frame the dividend policy.*
- *Implementing the principles and concepts used in financial decision making*

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. **(9)**

Sources of Finance : Sources and its features - Types-Long term sources- Equity, Preferred stock, Retained earnings, Term Loan- Short term sources - Bank Sources **(9)**

Capital Budgeting : Concept, Importance, Kinds of Investment Proposals, Capital appraisal Methods: Pay Back period method, Net Present Value method, Present value index method, Accounting rate of return method - Analysis of Risk and Uncertainty in Capital Budgeting.(Problems) **(9)**

Cost of Capital : Concepts -Classification - Cost of Debt - Cost of Equity - Cost of Retained Earnings - Weighted Average Cost of Capital (Problems). Leverages: Meaning - types - Operating and Financial Leverages - Combined Leverages (Problems) **(9)**

Capital Structure : Meaning and Relevance - Point of Indifference -Theories of Capital Structure: NI, NOI, MM and Traditional approaches - Factors determining Capital Structure. Dividend Policy: Irrelevance of dividends - Relevance of dividends - Determinants - Types of dividends **(9)**

Total : 45

REFERENCE BOOKS

1. *Khan and Jain, "Financial Management", Tata McGraw Hill, New Delhi, 2008*
2. *Pandey .I.M," Financial Management", Vikas Publshing House, New Delhi, 2005*
3. *Prasanna Chandra, "Financial Management", Tata McGraw Hill, New Delhi, 2008*
4. *Maheshwari .S.N," Financial Management", Kalyani Publishers*
5. *Brealey and Meyers, "Principles of Corporate Finance", Tata McGraw Hill,New Delhi, 2008*

17MDC44 - PRODUCTION AND OPERATIONS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

- *Recognize situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making on operations management and strategy..*
- *Predict the future demand by using quantitative approach of various business models for time series analysis.*
- *Find a better method to optimize Production planning.*
- *Analyze the available capacity, planned and unplanned loads to determine the production capacity of an enterprise.*
- *Demonstrate various maintenance schedule techniques for real time applications and also be able to identify the waste and the method of controlling and its disposal.*

INTRODUCTION

Introduction-Primary functions-Evolution of POM-Concept of Production-Production System-Production Management-Operation system-Operations Management-managing global operations- Factors affecting POM-Ways of studying POM-Design and development-Scope of production and operations. **(9)**

INFORMATION SYSTEMS IN POM

Information system for manufacturing and services-Productions and Operations-Contracting Production and Operations management-Business model-Transformation process- Input/output models - Cost and revenues, Profit- Productivity-stages of POM development-Organizational Positions and Career Opportunities in POM. **(9)**

MATERIALS MANAGEMENT AND AUTOMATION

Functions of Materials Management - Material Planning and Control-Purchasing- Stores Management-Inventory control-Standardization-Simplification-Value Analysis-Ergonomics-JIT-Automation- types-computer Integrated Manufacturing - Need for Automation- Automation Strategies- Automated Flow Line- Automated Guided Vehicles Systems-Automated Storage/Retrieval Systems-Carousel Storage Systems-Carousel Storage Applications. **(9)**

MAINTENANCE MANAGEMENT AND WASTE MANAGEMENT

Introduction to Maintenance management-Objectives of Maintenance-Types of Maintenance-Maintenance planning-Maintenance Scheduling-Maintenance Schedule Techniques-Total Productive Maintenance (TPM)-Waste Management-Reasons for Generation and Accumulation of Obsolete, Surplus and Scrap items-Identification and control of Waste-Disposal of Scrap. **(9)**

NEW PRODUCT DEVELOPMENT (NPD) AND SUSTAINABILITY

Introduction-Role of Organization-Competition for New Ideas, Resources, and Customers-Product Innovation failures-Continuous Project Management-New Growth Platforms for Innovation-Dynamics of Brand Share-Innovators and Imitators. **(9)**

Total : 45

TEXT BOOKS

1. *Gupta and Martin Starr., "Production and Operations Management Systems" CRC Press, 2014.*
2. *Anil Kumar.S and Suresh.N., "Productions and Operations Management", New Age International (p) Ltd, 2nd Edition, 2015.*

REFERENCE BOOKS

1. *Norman Gaither, Greg Frazier, "Operations Management "Thomson Learning 9th Edition, 2012.*
2. *Chary.S.N., "Theory and Problems in Production & Operations Management" Tata McGraw Hill 3rd Edition, 2012.*
3. *Jay H. Heizer, Barry Render., "Production and Operations Management: Strategies and Tactics", Allyn &Bacaon, 2011.*

17MDC45 - COMPUTER NETWORKS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC33

ASSESSMENT : THEORY

COURSE OUTCOME

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

FOUNDATION AND DIRECT LINK NETWORKS

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

INTERNETWORKING

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

END -TO - END PROTOCOLS

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

CONGESTION CONTROL AND RESOURCE ALLOCATION

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

APPLICATIONS

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

Total : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

17MDC46 - PREDICTIVE ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC16, 17MDC25

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Use R software to analyze multivariate data using multiple linear regression, discriminant function, logistic regression equation models and cluster analysis tools*
- *Using R software to analyze Time Series Models*
- *Identify underlying factors in multivariate data by applying factor analysis and principal component analysis models using R software packages*

CONCEPTS TO BE COVERED

1. Reading and Plotting Multivariate Data-Matrix scatter plot and Scatter plot with the Data Points Labelled by their Group
2. Calculating Summary Statistics for Multivariate Data-Means and Variances per group, Between-groups Variance and Within-groups Variance for a Variable
3. Calculating Covariances, Correlations and Standardizing Multivariate Data
4. Fitting Multiple Regression Equation using MS-Excel and interpreting the output
5. Writing Script files in R for Fitting Multiple Regression Equation: Summary, extracting ? coefficients, Covaraince matrix, standard errors, residuals and fitted values and plotting,Normal Probability Plot of residuals, Predictions-Compare the results using lm command
6. Step wise regression: forward, backward and stepwise using
7. Differencing a Time Series, Selecting a Candidate ARIMA Model,
8. Forecasting Using an ARIMA Model
9. Fitting logistic regression equation using glm(): Prediction, goodness of fit and Plotting ROC Curve
10. Discriminant function analysis using lda() and loadings for the discriminant functions
11. Principal component Analysis using prcomp() : screeplot to decide on the number of components to retain and loadings for the PCs and Scatter Plots for PCs
12. Factor Analysis using factanal()
13. Cluster Analysis-Hierarchical Clustering using hclust()
14. Cluster Analysis- Non-hierarchical Clustering Methods-K-means Method using kmeans()

TEXT BOOKS

1. *A. Coghlan, "A Little Book of R for Multivariate Analysis", Release 0.1, 2014,http://people.stat.sc.edu/hansont/stat730/Coghlan2014.pdf*
2. *A. Coghlan, "A Little Book of R for Time Series ", Release 0.2, 2018, https://media.readthedocs.org/pdf/a-little-book-of-r-for-time-series/latest/a-little-book-of-r-for-time-series.pdf*

17MDC47 - BUSINESS PROCESS OPTIMIZATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

17MDC12, 17MDC42, 17MDC44

ASSESSMENT : PRACTICALS

COURSE OUTCOME

- *Be able to use Of Excel and SciLab programming in solving problems in Operations Research.*
- *Gain knowledge in writing script files in SciLab to perform Optimization problems.*
- *Be able to use Excel in solving problems in Production problems.*
- *Be able to use Excel in solving problems in Operations management.*

CONCEPTS TO BE COVERED

1. A) Solve Linear Programming problems using Excel and Scilab
   B) Transportation Problem
   C) Assignment Problem
2. Perform sensitivity analysis using Excel and Scilab.
3. Solve Replacement problems using Excel and Scilab.
4. Integer Programming solutions using Excel.
5. Perform project Management using Excel.
6. Perform Inventory management using Excel.
7. Solve Just-in-Time and supply chain management problems using Excel.
8. Perform Operations scheduling using Excel.
9. Study a Quality management system using Excel and Scilab.
10. Study Production problems using Excel and Scilab.
11. Perform simulation of Single Server Queuing System using Excel.
12. Perform simulation of Able and Baker Problem using Excel.

17MDC48 - FINANCIAL ANALYSIS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Evaluate the various items to be included in the financial statements and create a dynamic financial model for preparing the financial statements.*
- *Widen and Deepen their knowledge on the financial statement linkages*
- *Prepare a financial model for time value of money, capital budgeting and cost of capital applications*
- *Analysing the working capital of a company*
- *Develop a model for detailed financial statements analysis model using Excel and Python.*

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 : 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. Financial Statement Analysis :
    a. Choose a listed company from BSE website
    b. Download the annual report
    c. Create a financial model for analysing the financial statements of the company
    d. Create a model for identifying the red flags in the statement
    e. Give recommendations for the company

17MDC49 - MANAGERIAL COMMUNICATION SKILLS

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Conceive appropriate verbal responses from the learners to a given social situation, using the guidelines to effective speaking skills and body language.*
- *Generate trouble shooting solutions to develop team building and interpersonal skills with case studies that focus on body language and empathy.*
- *Develop appropriate responses for business phone calls and formulate effective resolutions to professional conflicts that arise out of cross cultural communication gaps in a given managerial context.*
- *Compose appropriate written responses to professional problems faced by a team at the workplace arising out of ineffective communication skills.*

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 **(6)**

SOFT SKILLS

Introduction to Soft Skills - Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills: Time Management - Attitude - Responsibility - Ethics, Integrity, Values and Trust - Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed reading - Leadership - Body Language **(7)**

TELEPHONING SKILLS & NEGOTATIONS

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

WRITING SKILLS TO CREATE AN IMPRESSION

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

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" Mac Million Publishers, 2012.*
3. *Sai Lakshmi. B, "Poly Skills- A Course in Communication and Life Skills" Cambridge University Press, 2012.*

17MDC51 - ORGANISATIONAL BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC14

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop the skills for influencing and managing groups thus enhancing personal and interpersonal skills*
- *Assess the potential effects of organisation culture and conflict on behaviour and the effective management of stress.*
- *Analyse the functions of the organisation, individual behaviour and manage interactions in the workplace.*
- *Develop the human resource management skill and competencies in planning, control and problem solving*
- *Evaluate the management best practices tools and models to implement an effective HRM system*

Organisational Behaviour : Meaning - Organisation as work settings - Organisational Behaviour and Management - Ethics and Organisational Behaviour - Work force diversity. Organisational Conflict: Meaning -Types - Levels - Managing Conflict - Case Study. **(9)**

Organisational Culture : Concept - Observable aspects - Values and organisational culture - Managing organisational culture - Organisational development process and application - Change in organisation - Planned change strategies - Resistance to change- Case Study. **(9)**

Group Dynamics : Groups in organisation - Stages of group development - Group effectiveness - Group and intergroup dynamics - Decision making in groups - high performance teams -Team building. Interpersonal Relationship: Empowerment, Organisational politics, Essentials of Interpersonal Communication -- Case Study. **(9)**

Introduction to HRM : Meaning and definition of HRM -Organization of HR department: Line and Staff Aspects - Role of HR managers. Recruitment: Planning and Forecasting, Effective Recruiting- Selection: Basic Testing concept, Type of tests, Interviewing candidate: Features of interview- Case Study. **(9)**

Performance Maangement : Performance appraisal system - Techiques and methods for performance appraisal. Training & Development : The Training process- Training's strategic context, Five step training and development process, Types of Training. Compensation : Basic Factors in Determining pay rates- Establishing pay Rates, Competency -Based pay -- Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *John .R. Schermerhorn, James. G. Hunt and Richard. N. Osorn, "Organizational Behaviour" Wiley Publication, 7th Edition.*
2. *B. Narayan and Bharati Sharma, 1993; "Behavioral Science in Management" Omsons Publications, New Delhi.*
3. *Harlow/Hamke, 1975; "Behaviour in Organizations Text, Readings and Cases", Little, Brown and Company.*
4. *Stephen P. Robbins, 1985; "Organizational Behaviour, Concepts, Controversies and Applications", Prentice Hall of India Private Limited, New Delhi.*
5. *K. Aswathappa, "Organizational Behaviour Text, Cases and Games" Himalaya Publishing House, Mumbai, Sixth Edition (2005)*
6. *J. W. Newstrom, "Organizational Behaviour Human Behaviour at Work" Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition (2007)*

17MDC52 - DIGITAL MARKETING

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the impact of digital technology on the practice of marketing.*
- *Analyse the use of different forms of digital marketing in the development of an online presence.*
- *Develop a plan for marketing a product of business online.*
- *Integrate social media tools into a marketing communications strategy.*
- *Use a publishing platform to build a web presence with integrated data collection and links to social media.*

Understanding Marketing Management : Importance, Scope, Core Marketing Concepts, Marketing Tasks. Company Orientation towards Market Place: Evolution, New Marketing Realities. Marketing Mix: 4 Ps, Movement to 4 Cs & 7 Ps. **(9)**

Introduction to Digital Marketing : Need for digital marketing - Commonly used terminology - 4Cs : Customer, Content, Context and Conversation - three essential ingredients: Traffic, Insights and Conversions - Introduction to customer personas, buying process and their usability - Designing a basic digital marketing plan. **(9)**

Developing Marketing Strategies : Market Segmentation: Levels, Patterns, Bases, Effective Segmentation Criteria. Targeting: Approaches. Positioning : Steps, Differentiation Strategies. Competitive Dynamics: Strategies of Market Leaders, Challengers, Followers & Nichers. **(9)**

Building Online Presence : Introduction to Building online presence for businesses - basic terminology and technology - Website Domain: naming, working & registration - Website operation - Learn to host website - Introduction to WordPress - basic concepts of linking content using HTML.

Building Traffic: Different techniques for driving traffic or visitors to a website - Introduction to search engine optimization, Social media marketing, referral traffic, display ads, search engine marketing, affiliate marketing and email marketing. **(9)**

Getting Insights : Collect and analyze data of visitors to websites - Introduction to Google Analytics and Google Webmaster Tools - Workings of web analytics - Set up Google Analytics for a website - Set up goals and filters in Google Analytics - Access and interpret reports - Set up and use Google Webmaster Tools for effectiveness of search engine optimization.

Driving Conversions : Convert website visitors into buyers - Basic conversion tracking using Google Analytics and ad platforms - Introduction to Landing Pages - Different types of conversions - Campaign optimization - Learn to create a landing page using UnBounce. **(9)**

Total : 45

REFERENCE BOOKS

1. *Seema Gupta, "Digital Marketing", McGraw Hill, 2018.*
2. *Damian Ryan, "Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation", 3rd Edition, Kogan Page Ltd., 2014*
3. *Philip Kotler, Kevin Lane Keller, Abraham Koshy&MithileshwarJha, "Marketing Management: A South Asian Perspective", 14th Edition, Pearson, New Delhi, 2014*
4. *Dave Evans and Jake Mckee, "Social Media Marketing - The Next Generation of Business Engagement", Wiley India pvt. Ltd, New Delhi, 2011.*
5. *Perry Marshall, Thomas Melloche, "Ultimate Guide to Facebook Advertising", Tata McGraw Hill, New Delhi, 2011.*

17MDC53 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Choose and practice the software development process based on the factors such as problem complexity, time and cost to develop the software system*
- *Create the requirements model by specifying the use cases and actors involved in the scenario or by specifying the classes along with their responsibility and collaboration involved in the given problem to describe the requirements of the software system*
- *Design the architecture of the system in the various perspectives such as class model, component model and layered model based on the type of the proposed software system*
- *Design the test plans to conduct unit, integration, system and acceptance testing on the developed system*
- *Determine the size of the product by applying LOC or Function Point metrics*

INTRODUCTION

Software Definition - Software Application Domains - Legacy Software - The Software Process - Software Engineering Practice - Software Process Structure - Process Models: Prescriptive Process Models, Specialized Process Models, The Unified Process, Agile Process: Agile Principles, The Extreme Programming Process. **(8)**

MODELING

Understanding Requirements - Requirements Modeling : Scenario-Based Methods, Class Based methods, Web/Mobile Apps. **(6)**

DESIGN PROCESS

Design Concepts - Design Model : Architectural Design: Software Architecture, Architectural styles, Architectural Design - Component Level Design: Component Definition, Designing Class-Based Components, Component-Level Design for WebApps and Mobile Apps - User Interface Design: Interface Analysis, Interface Design, WebApp and Mobile Interface Design - Pattern-Based Design: Design Patterns, Pattern-Based Software Design, Architectural Patterns - WebApp Design - MobileApp Design. **(15)**

CODING AND TESTING

Code Review - Black Box Testing - White Box Testing - Debugging, Integration and System Testing. **(7)**

SOFTWARE PROJECT MANAGEMENT

Project Management Concepts - Software Project Management Complexities - Responsibilities of a Software Project Manager - Metrics for Project Size Estimation: Lines of Code, Function Point Metric - Project Estimation Technique: Basic COCOMO Model. **(9)**

Total : 45

TEXT BOOKS

1. *Roger S Pressman, "Software Engineering - A Practitioners Approach", Seventh Edition, McGraw Hill Edition, 2010.*
2. *Rajib Mall, "Fundamentals of Software Engineering", Fourth Edition, Prentice Hall India, 2014.*

REFERENCE BOOKS

1. *Ian Somerville,"Software Engineering", 9th edition,Pearson,2010.*
2. *Pankaj Jalote, "An integrated approach to Software Engineering", 3rd edition, Narosa publishing house, Reprint 2013.*

17MDC54 - ENTERPRISE RESOURCE PLANNING

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop the integrated approach to managers for various decision making*
- *Identify the various functional modules for vertical and horizontal workflow of business operations*
- *Develop a knowledge on the issues and challenges in developing a software for ERP*
- *Create an understanding on the implementation process of ERP.*
- *Create an understanding on the procedures of e-commerce and e-payment system*

Concept and Benefits of ERP : Definition of ERP - ERP potential in business transformation - Demand for ERP, Evolution - ERP market -Roles of ERP - Need for ERP-Gap analysis-Competitive environment analysis-Strategic needs analysis-Feasibility analysis-ERP project life cycle-cost elements **(9)**

ERP enabled Business process reengineering : Necessity of Reengineering-Business process re-engineering-Implementing BPR-BPR characteristics and steps-ERP and BPR-ERP modelling in BPR-Business case-Five stages- BE analysis. **(9)**

ERP project implementation : ERP implementation life cycle- ERP with respect to small and medium enterprises -Issues in ERP project management. **(9)**

E-Commerce and M-Commerce : E-commerce - Types - PCs and Networking -Concerns for e-commerce growth-Legal framework for e-commerce- M-commerce and Legal framework. **(9)**

E-Payment : Electronic payment systems - Requirements - E cash - Echeque - EFT - Credit Card Payment System - Micro payments - Payment gateways -Mobile payment methods - Mobile Banking. **(9)**

Total : 45

REFERENCE BOOKS

1. *Vinod Kumar Garg and Venkatakrishnan .N.K. "Enterprise Resource Planning Concepts and Planning", Prentice Hall,2011.*
2. *Mahadeo Jaiswal and GaneshVanapalli, "Enterprise Resource Planning",MacMillan Publications,2009.*
3. *Sadagopan.S, "ERP -A Managerial Perspective", Tata Mc.Graw Hill Publications,1999*
4. *Mary Sumner,"Enterprise Resource Planning",Pearson Publications,2005*
5. *Monk Wagner,"Concepts in ERP", Thomsan Publications,2009*

17MDC55 - HUMAN RESOURCES SYSTEM DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC41, 17MDC46

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Create a dashboard for employer, employee and admin to view the data's in the library created.*
- *Develop a knowledge of exploring the data used in HR analysis.*
- *Create charting and graphical representations of data for easy understanding*
- *Evaluate and investigate the datas to create models to meet the requirements of HR in decision making*
- *Create an HR system for workforce, Compensation, Recruitment, Selection and Performance analytics*

CONCEPTS TO BE COVERED

HR Analytics using Spread sheets and R platform :

Create a HR system for :

- Workforce analytics
- Compensation analytics
- Employee Churn analytics
- Recruitment and selection analytics
- Training analysis
- Employee Performance analysis

Steps to be followed for creating the HR system:

- Understanding HR indicators, Metrics and data
- Data Collection and tracking
- Assess IT requirements to meet HR needs
- Create the Libraries to view the structure of the data
- Data Exploration
- Graphs, Tables, Spread sheets, data manipulation
- Investigate the Data
- Create an Employee Dashboard
- Create a Manager Dashboard
- Create an Admin Dashboard

17MDC56 - DIGITAL MARKETING DESIGN LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC52

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design the landing page with professional lead magnets and copywriting*
- *Integrate analytics into the digital marketing process to gain insights*
- *Optimize the website so that the business can be displayed in the Google search engine*
- *Utilize social media for marketing*
- *Audit the impact of social media marketing*

CONCEPTS TO BE COVERED

- Identify a business for which digital marketing is to be launched
- Design the landing page
  - Create Lead Magnets
  - Perform Copywriting
- Integrate Google Analytics
- Email Marketing
  - Plan for Email campaign
  - Create Email templates and designs
  - Track the Email visitors
- Content and Blog Marketing
- Practice SEO (Search Engine Optimization) Techniques
- Social Media Marketing
  - Paid Ads
  - Marketing through Facebook, Instagram, Twitter, LinkedIn, Youtube
- Social Media Marketing Audit

17MDC57 - ENTERPRISE APPLICATION DEVELOPMENT LAB

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC35, 17MDC38

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Design and implement the web logic using Servlets, application logic using Session EJB and entity objects using Entity EJB, for a given business problem.*
- *Given a business scenario, design a solution using MVC Architecture and model the components needed for the solution.*
- *Given a business application, establish the connection between the database and application using JDBC and connect business applications to persistent data stores.*
- *For a given business scenario, design and create rich client application using RSS Feeds and Tags.*
- *Design and implement innovative business applications manifesting n-tier architecture.*

CONCEPTS TO BE COVERED

- Understand and design the generic business process model of an enterprise.
- Design enterprise applications using MVC Architecture
- Design and implement online business processing through Servlet components.
- Develop reusable business logics using Session EJB components.
- Develop persistent entity objects using Entity EJB components.
- Improve the business through developing enterprise blogs.
- Improve the user accessibility of the application by creating web feeds.

Business Applications relating to:

- Financial Accounting
- Marketing
- Sales
- Operations Management
- Human Resource Management Applications
- Customer Relations Management
- Supply Chain Management
- Collaborative Workforce management software
- Social Networking Applications

17MDC58 - PERSONALITY DEVELOPMENT

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.*

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. **(10)**

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 **(10)**

ETIQUETTE

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

Total : 30

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.*

17MDC61- ECONOMIC FOUNDATIONS OF BUSINESS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the Concepts of economics in the managerial decision making process.*
- *Analyse the production and cost function to maximise profit and minimise cost.*
- *Assess the basics of market structures in the business environment.*
- *Enumerate the GDP and assess its impact on the economic policy*
- *Develop the micro and macro economic approaches in business decisions.*

Principles of Economics: Decisions, Interaction, Economy as a Whole Works. Economist as Scientist: Scientific Method, Assumptions, Economic Model, Microeconomics and Macroeconomics. Economist as policy advisor: Positive Vs Normative analysis, Economists disagree in scientific judgment. Values: Perception Vs Reality. **(9)**

The Market Forces of Supply and Demand: Market and Competition, Demand, Supply, Supply and Demand Equilibrium. Elasticity and Its Application: Elasticity of Demand, Elasticity of Supply, Applications of Elasticity of demand and supply. **(9)**

Production and costs : Production function, Types of costs, costs in short run and in the long run. Firm and market structure: Competitive Markets, Monopolistic Competition, Oligopoly and Monopoly. **(9)**

Monetary System : Functions of Money, Kinds of Money, Banks and the Money Supply. Money Growth and Inflation: Classical Theory of Inflation, Costs of Inflation. Measuring a Nation's Income:Economic Income and Expenditure, Gross Domestic Product, Components of GDP, Real versus Nominal GDP. **(9)**

Aggregate Demand and Aggregate Supply : Key Facts about Economic Fluctuations, Explaining Short-Run Economic Fluctuations, Aggregate-Demand Curve, Aggregate-Supply Curve, Causes of Economic Fluctuations. Influence of Monetary and Fiscal Policy on Aggregate Demand: Monetary Policy Influences, Fiscal Policy Influences and Using Policy to Stabilize the Economy. **(9)**

Total : 45

REFERENCE BOOKS

1. *N. Gregory Mankiw, "Principles of Macroeconomics", 6th Edition, South-Western Cengage Learning, USA, 2012.*
2. *N. Gregory Mankiw, "Principles of Microeconomics", 7th Edition, Cengage Learning, Stamford, USA, 2012.*
3. *Varshney R.L & Maheshwari.K.L, "Managerial Economics" Sultan Chand & Sons, New Delhi, 2013.*
4. *Mehta P.L, Managerial Economics, Sultan Chand & Sons: New Delhi, 2008.*

17MDC62 - COMPUTATIONAL INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand the basics of Intelligent Agents and Searching Strategies*
- *Build Simple Knowledge based systems*
- *Demonstrate working Knowledge of reasoning in the presence of uncertain knowledge*
- *Apply various decision making methods in real world environment*
- *Analyze and apply the application view of artificial Intelligence*

INTRODUCTION

Introduction to Computational Intelligence - Computational Intelligence Paradigms **(5)**

ARTIFICIAL INTELLIGENCE

INTRODUCTION : Intelligent Agents - Solving Problems by Searching - Adversial Search- Constraint Satisfaction Problems.

KNOWLEDGE, REASONING AND PLANNING : Logical Agents - First Order Logic - Inference in First order Logic - Knowledge Representation. **(12)**

ARTIFICIAL NEURAL NETWORKS

Artificial Neuron : Calculating the Net Input Signal - Activation Functions - Artificial Neuron Geometry- Artificial Neuron Learning **(6)**

Supervised Learning Neural Networks : Neural Network Types - Supervised Learning Rules - Functioning of Hidden neurons - Ensemble Neural Networks **(7)**

Unsupervised Learning Neural Networks : Background - Hebbian Learning Rule - Principal Component Learning Rule - Learning Vector Quantizer-I - Self-Organizing Feature Maps **(7)**

EVOLUTIONARY COMPUTATION Introduction - Genetic Algorithms - Genetic Programming - Evolutionary Programming **(8)**

Total : 45

TEXT BOOKS

1. *Andries P. Engelbrecht, "Computational intelligence: an introduction", editon 2, John Wiley and Sons, 2007.*
2. *Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern Approach", Pearson Education, 3rd Edition, 2010.*

REFERENCE BOOKS

1. *Elaine Rich, Kevin Knight, Shivashankar B. Nair "Artificial Intelligence", Tata McGraw Hill, 3rd Edition.*
2. *Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice-Hall of India, 2008.*

17MDC63 - MOBILE AND CLOUD COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC33, 17MDC45

ASSESSMENT : THEORY

COURSE OUTCOME

CO1 : *Illustrate the roles of the protocols and architectural components employed in a wireless network technology.*

CO2 : *Describe the adaptations of the various traditional entities to accommodate the issues imposed by mobile environment*

CO3 : *Illustrate the fundamental concepts of cloud computing technology.*

CO4 : *Recognize the levels and mechanisms of resource virtualization applicable for scalable computing.*

CO5 : *Choose appropriate service providers, tools and platforms for implementing cloud computing solutions in an organization considering its requirements.*

MOBILE COMPUTING

Introduction and Layer 1 and 2 of Network Stack : Components of wireless communication systems - Architecture of a Mobile Telecommunication systems - Wireless Networking standards - Wireless LAN Networks - Bluetooth Technologies- Characteristics of Mobile computing - structure of Mobile computing applications - Cellular Mobile communication Technologies : GSM - GPRS - UMTS - MAC protocols. **(9)**

Higher Layers : Mobile Internet Layer - Mobile Transport Layer - Mobile Databases - Operating systems for Mobile computing - Application of Mobile computing: Mobile Commerce **(9)**

CLOUD COMPUTING

Overview of Cloud Computing : Introduction - NIST Cloud Model - Benefits of Cloud Computing - Challenges of Cloud Computing - Cloud-Enabling Technologies - Cloud Standards and References - Cloud Deployment Models - Cloud Service Delivery Models

Cloud Reference Architecture : Introduction to Reference Framework - Role-based Cloud Computing Reference Architectures - Layer-based Cloud Computing Reference Architectures **(9)**

Introduction to Virtualization : Need - Benefits and Limitations - Approaches to Virtualization - Types of Virtualization - Virtualization Concepts: Computer System Architecture - Virtual Machines - Virtualization Software - Resource Virtualization: Processor - Memory - Storage - Network - Input/Output

Cloud Programming and Software Environments - Amazon Web Services - Microsoft Cloud Platform - Google Cloud Platform **(9)**

Cloud Storage System : Basics - Models - Architecture - File Systems - Data Store and Access - Protocols

Cloud Computing Security : Significance of Security - Identified Cloud Security Issues - Categorization of Cloud Security Issues - State-of-the-Art Solutions - Security Reference Architecture - Identity and Access Management

Case Studies : Cloud Service Providers, Scenarios for Cloud Adoption for Small, Medium and Large Enterprises, Incidents on Cloud Security **(9)**

Total : 45

TEXT BOOKS

1. *Pattnaik, Prasant Kumar, Mall, Rajib, "Fundamentals of Mobile Computing", Second Edition, PHI, 2016. (Para I,II)*
2. *A.Kannammal, "Fundamentals of Cloud Computing", Cengage Learning, 2015.*

REFERENCE BOOKS

1. *Jochen Schiller, "Mobile Communications", Addison-Wesley, 2004.*
2. *Raj Kamal, "Mobile Computing", Oxford university press, 2nd edition, 2012.*
3. *Rajkumar Buyya, Christian Vecchiola and S.ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill, 2013.*
4. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005.*

17MDC64 - DATA WAREHOUSING AND MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34

ASSESSMENT : THEORY

COURSE OUTCOME

Upon completion of the course, the students should be able to:

- *Demonstrate the need for data preprocessing and suggest appropriate methods to produce proper data sources for mining.*
- *Analyze the suitability of design technique to find mining solution with efficient time, cost and memory requirement.*
- *Interpret optimized decisions by building data warehouse and employing the mining concepts in business intelligence problems.*
- *Construct a legitimate mining solution with the help of design technique guidelines and validate the suitability of the techniques applied.*
- *Device suitable methods for mining unstructured data in vaiours applications.*

INTRODUCTION

Definition and need of data mining, Kinds of data and patterns, Applications and issues. Types of data : Data objects and attribute types, Measuring data similarity and dissimilarity. Data Pre-processing: Overview, data cleaning, data integration, data reduction, data transformation and data discretization. **(15)**

DATA WAREHOUSE AND OLAP TECHNOLOGY

Data warehouse-basic concepts, data warehouse modelling, data warehouse implementation **(9)**

DATA MINING TECHNIQUES

Mining Frequent Patterns and Associations : Basic concepts, Frequent itemset mining methods.

Classification : Basic concepts, Decision tree induction, Bayes classification methods.

Cluster Analysis : Basic concepts and methods, partitioning methods, hierarchical methods: Agglomerativeand divisive hierarchical clustering.

Outlier Detection : Outliers and Outlier Analysis, Outlier Detection Methods. **(16)**

DATA MINING TRENDS

Mining Sequence Data, Mining Other Kinds of Data, Visual and Audio Data Mining, Data mining applications. **(5)**

Total : 45

TEXT BOOK

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

REFERENCE BOOK

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

17MDC65 - MOBILE AND CLOUD APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC38

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Optimize websites for mobile devices using HTML5.*
- *Design and Build a fully functional store-worthy Android app that is aware of the resource constraints of mobile devices.*
- *Demonstrate knowledge on creating, cloning, migrating virtual machines using a virtualization tool*
- *Utilize public cloud services and offer services in cloud.*
- *Illustrate containarization by developing suitable applications.*

CONCEPTS TO BE COVERED

Mobile Application Development :

HTML5 :

Creation of fully functional HTML5 app

Android :

Building a basic UI-driven App

Using Phone Gap to package HTML5 apps into native apps

Creating Android services

Applications carrying out data management with SQLite3

Basic Networking using WebKit

Image manipulation

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

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 Google App Engine
5. Working with Docker Containers.

17MDC66 - DATA MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC34

ASSESSMENT : PRACTICAL

COURSE OUTCOME

The student will

- *Employ data cleaning techniques for normalization and standardization of given dataset.*
- *Determine the mining solutions using data mining techniques in real time problems.*
- *Implement mining techinques, infer and interpret the accurancy of the result.*
- *Find the outliers using various Outlier Detection methods in a given dataset.*
- *Evaluate the accuracy of measures for text retrieval and classification of Web documents.*

CONCEPTS TO BE COVERED

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

Tool : RapidMiner / Wega / R

17MDC71 - PROJECT WORK AND VIVA VOCE - I

L	T	P	C
18			

PRE-REQUISITES

Should have undergone all courses upto 6th Semester

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Perform quantitative and qualitative data analytics in functional areas of business*
- *Analyze business problems using mathematical and statistical modeling and enable data driven decision making.*
- *Analyze the issues in software solutions*
- *Develop enterprise applications applying software engineering principles and business domain knowledge*
- *Visualize and infer meaningful insights to facilitate strategic and operational decisions*
- *Apply and demonstrate software development standards in the software industry*
- *Work in a team to develop solutions for real time applications and solve research issues*

17MDC81 - MODELING AND SIMULATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Define Simulation, Systems, models and perform basic manual simulations*
- *To illustrate changes in the dynamic systems like queuing system using simulation.*
- *To predict the behavior of linear and non-linear systems using empirical modeling*
- *To evaluate the behavior of deterministic and stochastic systems using Simulation techniques*

INTRODUCTION TO SIMULATION

When Simulation Is the Appropriate Tool - When Simulation Is Not Appropriate- Advantages and Disadvantages of Simulation- Areas of Application- Systems and System Environment- Components of a System- Discrete and Continuous Systems - Model of a System- Types of Models- Discrete-Event System Simulation- Steps in a Simulation Study

Simulation example-Queuing-Inventory-General Principles of Simulation. **(9)**

STATISTICAL BASICS AND QUEUING MODEL SIMULATION

Useful Statistical Models- Discrete Distributions - Continuous Distributions- Poisson Process- Properties of a Poisson Process- Non-stationary Poisson Process- Empirical Distributions-

Characteristics of Queuing Systems- Queuing Notation- Long-Run Measures of Performance of Queuing Systems- The Conservation Equation- Steady-State Behavior of Infinite-Population Markovian Models - Single-Server Queues with Poisson Arrivals and Unlimited Capacity: M/G/1, Multi-server Queues - Steady-State Behavior of Finite-Population Models- Networks of Queues **(9)**

RANDOM NUMBERS

Generation of Pseudo-Random Numbers- Techniques for Generating Random Numbers- Linear Congruential Method- Combined Linear Congruential Generators- Tests for Random Numbers- Frequency Tests, Tests for Autocorrelation-Random variate generation-Inverse-Transform Technique- Exponential Distribution- Uniform Distribution- Weibull Distribution- Triangular Distribution- Empirical Continuous Distributions- Continuous Distributions without a Closed-Form Inverse- Discrete Distributions- Acceptance-Rejection Technique- Poisson Distribution- Non-stationary Poisson Process- Gamma Distribution- Direct Transformation for the Normal and Lognormal Distributions- Convolution Method-special properties. **(9)**

ANALYSIS OF SIMULATION DATA

Input Modeling- Data Collection- Identifying the Distribution with Data-Histograms- Selecting the Family of Distributions-Quantile-Quantile Plots- Parameter Estimation- Preliminary Statistics: Sample Mean and Sample Variance- Suggested Estimators- Goodness-of-Fit Tests- Chi-Square Test-Kolmogorov--smimov Goodness-of-Fit Test.

Verification and Validation of Simulation Models- Model Building, Verification, and Validation- Verification of Simulation Models- Calibration and Validation of Models- Face Validity-Validation of Model Assumptions-Validating Input-Output Transformations- Input-Output Validation: Using Historical Input Data- Input-Output Validation: Using a Turing Test

OUTPUT ANALYSIS FOR A SINGLE MODEL

Comparison of Two System Designs-Independent Sampling with Equal Variances-Independent Sampling with Unequal Variances. Meta modeling. **(9)**

SIMULATION SOFTWARES / LANGUAGE

Manufacturing systems and Material Handling system

Simulation Software : History of Simulation Software- Selection of Simulation Software-An Example Simulation- Simulation in GPSS- Arena-AutoMod-ProModel- QUEST- SIMULA-Witness- Extend, Simio.

Simulation of Manufacturing and Material-Handling Systems : Manufacturing and Material-Handling. Simulations- Models of Manufacturing Systems- Models of Material-Handling Systems- Goals and Performance Measures- Issues in Manufacturing and Material-Handling Simulations- Modeling Downtimes and Failures- Trace-Driven Models- Case Studies of the Simulation of Manufacturing and Material-Handling Systems **(9)**

Total : 45

TEXT BOOK

1. *Jerry Banks,John S. Carson II,Barry L Nelson, David M Nicol, Discrete-Event System Simulation, Second Edition, Prentice Hall, 1996.*

REFERENCE BOOKS

1. *Law A.M. & Kelton, W.D, Simulation Modeling and Analysis, 2nd ed, New York McGraw Hill Inc. (1991*
2. *Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition, 1978, ISBN:81-203-0140-4.*
3. *FrankR.Giordano, Maurice D.Weir and William P.Fox. Mathematical Modeling, Thomson Brooks/Cole, Vikas Publishing House Pvt Ltd., New Delhi.[Para 1, II & III]*
4. *H.Sayama, Introduction to the Modeling and Analysis of Complex Systems, Open SUNY Textbooks, Milne Library State University of New York at Geneseo,Geneseo, NY 14454, 2015.*
5. *Clive L.Dym, Principles of Mathematical Modeling, 2nd Edition, Elsevier, 2004.*

17MDC82 - DECISION SUPPORT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC54

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the components of Decision Support Systems*
- *Work with data modeling and visualization for the given management problem*
- *Choose appropriate model to be used for a problem and design Decision Support System accordingly*
- *Analyze different tools and technologies for knowledge management in an organization*
- *Apply advanced intelligent system concepts to provide insight in the business*

INTRODUCTION

Management Support Systems : Overview : Managers and Decision-Making - Managerial Decision-Making and Information Systems - Managers and Computer Support - Computerized Decision Support and the Supporting Technologies - A Framework for Decision Support - The Concept of Decision Support Systems - Group Support Systems - Enterprise Information Systems - Knowledge Management Systems - Expert Systems - Artificial Neural Networks - Advanced Intelligent Decision Support Systems - Hybrid Support Systems.

Decision-Making Systems, Modeling and Support : Decision-Making: Introduction and Definitions - Systems - Models - Phases of the Decision-Making Process - Decision-Making: The Intelligence Phase - The Design Phase - The Choice Phase - The Implementation Phase - Decision Support Strategy - Personality Types, Gender, Human Cognition, and Decision Styles - The Decision-Makers. **(10)**

DECISION SUPPORT SYSTEMS (DSS)

Decision Support Systems : Configuration - Characteristics and Capabilities of DSS - Components of DSS - The Data Management Subsystem - The Model Management Subsystem - The User Interface Subsystem - The Knowledge-Based Management Subsystem - The User - DSS Hardware - DSS Classifications.

Modeling and Analysis : Management Support System (MSS) Modeling - Static and Dynamic Models - Certainty, Uncertainty, and Risk - Influence Diagrams - MSS Modeling with Spreadsheets - Decision Analysis of a Few Alternatives - The Structure of MSS Mathematical Models - Mathematical Programming Optimization - Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking - Problem-Solving Search Methods - Heuristic Programming - Simulation - Visual Interactive Modeling and Visual Interactive Simulation - Quantitative Software Packages. **(10)**

BUSINESS INTELLIGENCE

The Nature and Sources of Data - Data Collection, Problems, and Quality - The Web/Internet and Commercial Database Services - Database Management Systems in Decision Support Systems/Business Intelligence - Database Organization and Structures - Data Warehousing - Data Marts - Business Intelligence/Business Analytics - Online Analytical Processing (OLAP) - Data Mining - Data Visualization, Multidimensionality, and Real-Time Analytics - Geographic Information Systems - Business Intelligence and the Web: Web Intelligence/Web Analytics. **(13)**

DECISION SUPPORT SYSTEM DEVELOPMENT

Introduction to DSS Development - The Traditional System Development Life Cycle - Alternative Development Methodologies - Prototyping: The DSS Development Methodology - Change Management - DSS Technology Levels and Tools - DSS Development Platforms - DSS Development Tool Selection - Team-Developed DSS - End User Developed DSS - Putting The DSS Together. **(5)**

GROUP SUPPORT SYSTEMS AND KNOWLEDGE MANAGEMENT

Group Support Systems : Group Decision-Making, Communication, and Collaboration - Communication Support - Collaboration Support: Computer-Supported Cooperative Work - Group Support Systems - Group Support Systems Technologies - Groupsystems

Meetingroom and Online - The GSS Meeting Process - Distance Learning - Creativity and Idea Generation.

Knowledge Management : Introduction to Knowledge Management - Organizational Learning and Transformation - Knowledge Management Initiatives - Approaches to Knowledge Management - Information Technology in Knowledge Management - Knowledge Management Systems Implementation - Roles of People in Knowledge Management. **(7)**

TOTAL : 45

TEXT BOOK

1. *Efraim Turban and Jay E. Aronson, Decision Support System and Intelligent Systems, Prentice Hall International, 9th Edition 2010*

REFERENCE

1. *V.L. Sauter, Decision Support Systems For Business Intelligence, New York: John Wiley & Sons, 2011*

17MDC83 - GAME THEORY AND DECISION ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design game model to describe the issue using game theory strategies*
- *Analyze and derive decisions using decision tree and analysis methods*
- *Design and perform decision analysis using Markov chain principles and 6 Sigma Concepts*

GAME THEORY : Decision making-Description of a game-Basic elements of game theory- the Two Person, zero-sum Games - Characteristics of a game- The maxmin and minmax principles- Steps in solving the game- Saddle point method- Principle of dominance in games- Solutions to 2 x 2 games without saddle point: (Mixed strategies)- Method of Oddments (for 2 × 2 games)- Solutions to 2 × n or m × 2 games-Graphical Method-Algebraic Method-Method of Linear Programming-Iterative Method for Approximate Solution-Bidding Problems-n- Person Zero sum games. Strategic games-Nash Equilibrium. **(12)**

DECISION ANALYSIS : Decision Making without Experimentation- Decision Making with Experimentation- Decision Trees-Using Spreadsheets to Perform Sensitivity Analysis on Decision Trees-Utility Theory- The Practical Application of Decision Analysis- Advanced Decision Trees- Chi-Square Automatic Interaction Detection (CHAID)-CHAID Tree Development-Bonferroni Correction-Generating Business Rules using CHAID Tree-Classification and Regression Tree-Gini Impurity Index-Entropy-Cost-Based Splitting Criteria-Ensemble Method-Random Forest **(12)**

MULTI-CRITERION DECISION MAKING : Multi-attribute Decision making - an overview-classification of MCDM methods-deterministic, stochastic and fuzzy-MCDM application areas-MCDM methods-The weighted sum model-The weighted product model-The Analytic Hierarchy process-The revised Analytic Hierarchy process-Goal Programming-The ELECTRE method-The TOPSIS method-Sebsitivity analysis of MCDM methods-Data Estimation of MCDM Problems. **(10)**

STOCHASTIC MODELS-MARKOV CHAINS : Introduction to Stochastic Process-Poisson Process-Compound Poisson Process-- Markov Chains - Chapman-Kolomogorov Equation - Classification of States of Markov Chain - Long run properties of Markov Chains- First Passage times-Markov Chains with Absorbing States- Expected Duration to Reach a State from other States-Calculation of Retention Probability and Customer Lifetime Value using Markov Chains-Markov Decision Process (MDP) **(6)**

SIX SIGMA : Introduction to Six Sigma- What is Six Sigma?- Origins of Six Sigma- Three-Sigma versus Six-Sigma Process- Cost of Poor Quality- Sigma Score- Industrial Applications of Six Sigma- Six Sigma Measures- Yield- DMAIC Methodology. **(5)**

Total : 45

TEXT BOOKS

1. *Rama Murthy P. Operations Research, New Age Intenational, Second Edition, 2007, New Delhi [Para 1]*
2. *Dinesh Kumar U. Business Analytics, Wiley, First Edition, 2017 [Para 2,4,5]*
3. *Triantaphyllou, Evangelos. (2000). Multi-Criteria Decision Making Methods: A Comparative Study. 10.1007/978-1-4757-3157-6, Kluwer Academic Publishers[Para 3]*

REFERENCE BOOKS

1. *Martin Osborne, An Introduction to Game Theory, Oxford University Press, 2003*
2. *Frederick S.Hiller, Gerald J.Leberman, Bodhibrata Nag and PreetamBasu, "Introduction to Operations Research", Ninth Edition, McGraw Hill, 2010.*
3. *HamdyA.Taha, "Operations Research - An Introduction", Eighth Edition, 2010.*
4. *EdmundasKazimierasZavadskas (2019), Multiple-Criteria Decision-Making (MCDM) Techniques for Business Processes Information Management, Publisher: MDPI AG*

5. *Belton, Valerie and Theodor Stewart (2001), Multi Criterion Decision Analysis : An Integrated Approach, Springer.*
6. *Cliff T. Ragsdale, Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, Thomson South-Western*
7. *Avinash K. Dixit and Barry J. Nalebuff, The Art of Strategy, Norton, 2008.*

INTERNET RESOURCES

1. *E. Triantaphyllou, B. Shu, S. Nieto Sanchez, and T. Ray: Multi-Criteria Decision Making: An Operations Research Approach. Encyclopedia of Electrical and Electronics Engineering, (J.G. Webster, Ed.), John Wiley & Sons, New York, NY, Vol. 15, pp. 175-186, (1998).*
2. *Mark Velasquez1and Patrick T. Hester, An Analysis of Multi-Criteria Decision Making Methods. International Journal of Operations Research Vol. 10, No. 2, 56?66 (2013)*
3. *Vyas S. &MisalCheta S. Comparative Study of different Multi-criteria Decuision*

   Making methods. International Journal on Advanced Computer Theory and Engineering (IJACTE), 2319 - 2526, Volume-2, Issue-4, 2013

17MDC84 - BUSINESS INTELLIGENCE LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC64, 17MDC66

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Can understand and transform given data in any form to a suitable standard form for performing analysis using tools.*
- *Able to construct appropriate data warehouse model for a given decision making problem.*
- *Apply various techniques and tools to perform operations on multidimensional data.*
- *Generate various levels of analysis reports of data in different forms for inference.*
- *Design and develop dashboards and scoreboards to present the analysed data in a format that help the decision makers to do the prediction.*

CONCEPTS TO BE COVERED

1. Perform ETL processes using large datasets of CSV, XML, XLS, ARFF and other formats.
2. Build Data warehouse using appropriate schema for various business scenarios.
3. Perform OLAP operations using multidimensional data.
4. Perform Exploratory data analysis using Views, concept hierarchies and data cubes.
5. Create BI dashboards and scoreboards to turn insights into actions for various business scenarios.
6. Present the analysed data using maps,plots, graphs and other visualization formats.
7. Generate a powerful, multi-step alert engine that can trigger workflows.

TOOLS REQUIRED

Tableau /Kibana / Business intelligence development studio /SQL Server data tools (SSIS, SSAS, SSRS)

17MDC85 - DECISION ANALYSIS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC81

ASSESSMENT : LABORATORY

COURSE OUTCOME

- *Design game model to describe the issue using game theory strategies*
- *Analyze and derive decisions using decision tree and analysis methods*
- *Design and perform decision analysis using 6 Sigma Concepts*

CONCEPTS TO BE COVERED

1. Solving Game Theory Problems using MS-Excel: Maxmin and Minmax criteria
2. Solving Game Theory Problems using MS-Excel: Principle of dominance
3. Solving Game Theory Problems by Linear Programming using MS-Excel's Solver
4. Repeating Exercises 1,2 using R
5. Repeating Exercises 3 using R
6. Solving Game Theory Problems using Gambit software
7. Solving Decision Analysis problems using MS-Excel
8. Using Spreadsheets to Perform Sensitivity Analysis on Decision Trees
9. Construction of Decision Trees using R Packages
10. Construction of Random Forest using R Packages
11. Analysing Decision Trees using TreePlan software
12. Solving MCDM problems using software packages like DEFINITE, MCDA package for R
13. Solving MCDM problems using software packages
14. Computing n-step probabilities using MS-Excel and R
15. Computing steady state probabilities using MS-Excel and R
16. Six Sigma Methodology using Software Packages

17MDC86 - ENTREPRENEURSHIP DEVELOPMENT

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Have the ability to discern distinct entrepreneurial traits*
- *Know the parameters to assess opportunities and constraints for new business ideas*
- *Understand the systematic process to select and screen a business idea*
- *Design strategies for successful implementation of ideas*
- *Evaluate the procedures and prepare a business plan*

UNIT I : Introduction to Entrepreneurship : Meaning, Theories, Categories, Significance. Entrepreneurial India: Evolution over centuries, Current trends. Myths about Entrepreneurship: Myths about passion, surety in riches, financial backing, influential people. Entrepreneur: Definition, Characteristics, Types, Challenges. Entrepreneurship Ecosystem: Context, Positive influencers, Players.-Case Study **(6)**

UNIT II : Intrapreneurship : Meaning, Need, Difference from entrepreneurship, Hurdles, Successful practices. Entrepreneurial Motivation: Key drivers, Mindset, Theories. Entrepreneurial Competencies: Identification & development of competencies, Role of EDPs-Case Study. **(6)**

UNIT III : Business Idea Generation : Approach, Techniques. Opportunity Analysis: Opportunity sighting, evaluation, Mapping ideas to opportunities. Business Modelling: Meaning, Functions, Types, Design & interpretation. Business Planning: Types, Myths, Sections, Documentation Tips. Business Plan Review: Business Model review, Financial review, Technical feasibility Review-Case Study. **(6)**

UNIT IV : Business Creation : Entity types, Steps in setting up a unit, Compliances &approvals.Evolution of a start-up: Key factors, Evolution modelling, Dimensions of maturity. Innovation for Business Growth: Concept, Process, Challenges. Business Sickness: Symptoms, Causes, Remedial measures & rehabilitation-Case Study. **(6)**

UNIT V : Women Entrepreneurship : Need, Development, Benefits, Challenges. Rural Entrepreneurship: Opportunities, Benefits, Role of Government. Social Entrepreneurship: Need, Types & characteristics of social enterprise, Measures of success, Benefits, Sociopreneur-Case Study. **(6)**

Total : 30

REFERENCE BOOKS :

1. *Raj Shankar, "Entrepreneurship: Theory & Practice", 1st Edition, Tata McGraw Hill, New Delhi, 2009.*
2. *Robert D. Hisrich, Michael P. Peters Dean A. Shepherd, "Entrepreneurship", 9th Edition, McGraw Hill/Irwin, 2012.*
3. *Rajeev Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, New Delhi, 2011.*
4. *S. S. Khanka, Entrepreneurial Development, S.Chand and Co, New Delhi, 2012.*

17MDC91 - PRINCIPLES OF INFORMATION SECURITY

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC33, 17MDC45

ASSESSMENT : THEORY

COURSE OUTCOME

Upon Completion of the course, the students shall be able to:

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

INTRODUCTION

Information Security Concepts, Critical Characteristics of Information, CNSS Security Model,Components of an Information System, Security in the Systems Development Life Cycle **(3)**

SECURITY ANALYSIS

Need for Security : Business Needs, Threats and Attacks.

Legal, Ethical and Professional Issues in Information Security: Law and Ethics, Ethics and Information Security **(9)**

SECURITY PLANNING

Information Security Policy, Standards and Practices. The Information Security Blueprint. Security Education, Training and Awareness, Continuity Strategies **(6)**

RISK MANAGEMENT

Overview, Risk Identification, Risk Assessment, Risk Control, Quantitative Versus Qualitative Risk Control Practices **(9)**

SECURITY TECHNOLOGY

Security Technology : Access Controls, Firewalls and VPNs, Intrusion Detection and Prevention Systems and Other Security Tools

Cryptography : Foundations of Cryptology, Cipher Methods, Cryptographic Algorithms, Cryptographic Tools, Protocols for Secure Communication. **(12)**

IMPLEMENTATION AND MAINTENANCE

Implementing Information Security : Information Security Project Management, Technical Aspects of Implementation, Nontechnical Aspects of Implementation

Security and Personnel : Positioning and Staffing, Credentials for Information Security Professionals, Employment Policies and Practices

Information Security Maintenance : Security Maintenance Models, Digital Forensics

Case Study : Latest Practices and Impact of Emerging Technologies **(6)**

Total : 45

TEXT BOOK

1. *Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Cengage Learning, 6th Edition, 2017.*

REFERENCE BOOKS

1. *Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3 CRC PressLLC, 2004.*
2. *Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003*
3. *Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.*

17MDC92 - PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *The selection and initiation of projects in the enterprise*
- *Conduct project planning activities that accurately forecast project costs, timelines and quality .*
- *Implement the project for successful resource communication and risk management.*
- *Demonstrate effective project execution and control techniques that result in successful projects.*
- *Demonstrate effective organisation leadership skills for managing projects, project teams and stakeholders.*

BASICS OF PROJECT MANAGEMENT : Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Management Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Project Management Principles. **(9)**

PROJECT IDENTIFICATION AND SELECTION : Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point **(9)**

PROJECT PLANNING : Introduction, Project Planning, Need of Project Planning, Project Life Cycle - PERT and CPM: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System **(9)**

RESOURCES CONSIDERATIONS IN PROJECTS : Introduction, Resource Allocation, Scheduling, Project Cost Estimate and Budgets, Cost Forecasts

PROJECT RISK MANAGEMENT : Introduction, Risk, Risk Management, Role of Risk Management in Overall Project Management, Steps in Risk Management, Risk Identification, Risk Analysis, Reducing Risks **(9)**

PROJECT PERFORMANCE MEASUREMENT AND EVALUATION: Introduction, Performance Measurement, Productivity, Project Performance Evaluation, Benefits and Challenges of Performance Measurement and Evaluation, Controlling the Projects

PROJECT EXECUTION AND CONTROL : Introduction, Project Execution, Project Control Process, Purpose of Project Execution and Control **(9)**

TOTAL: 45

REFERENCE BOOKS

1. *Prasanna Chandra, "Projects: Planning, Analysis. Selection. Implementation and Review", Tata McGraw- Hill: New Delhi, 2002.*
2. *Gopalakrishnan, Ramamoorthy, "Project Management", Macmillan: New Delhi, 1993.*
3. *Harold Kerzner, "Project Management : A Systems Approach to Planning, Scheduling and Controlling", 2009.*
4. *Larson, E.W. and Gray, C.F., "Project management the managerial process", Seventh Edition, McGraw-Hill, 2018.*
5. *"UNIDO - Guidelines for Project Evaluation", USA: Oxford, IBH, 1972.*
6. *Prasanna Chandra, "Projects: Planning, Analysis. Selection. Implementation and Review", Tata McGraw- Hill: New Delhi, 2002.*
7. *Gopalakrishnan, Ramamoorthy, "Project Management", Macmillan: New Delhi, 1993.*
8. *UNIDO - Guidelines for Project Evaluation, USA: Oxford, IBH, 1972.*

17MDC93 - HUMAN COMPUTER INTERFACE AND INTERACTION

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *Gain knowledge in the foundations of Human Computer Interface and Interaction*
- *Investigate emerging human computer interfaces and paradigms and implement them into prototype and products with original interfaces and interactions for web, PC, mobile, handheld, or next generation platforms*
- *Be familiar with the design technologies for individuals and persons with disabilities.*
- *Be aware of handheld and conventional HCI.*
- *Learn the guidelines for user interface.*

FOUNDATIONS OF HCI

The Human: I/O channels - Memory - Reasoning and problem solving; The computer: Devices - Memory -processing and networks; Interaction: Models - frameworks - Ergonomics - styles - elements - interactivity- Paradigms. **(9)**

DESIGN & SOFTWARE PROCESS

Interactive Design basics - process - scenarios - navigation - screen design - Iteration and prototyping. HCI in software process- software life cycle - usability engineering - Prototyping in practice - design rationale. Design rules - principles, standards, guidelines, rules. Evaluation Techniques - Universal Design. **(9)**

MODELS AND THEORIES

Cognitive models -Socio-Organizational issues and stake holder requirements -Communication and collaboration models- Hypertext, Multimedia and WWW. **(9)**

MOBILE HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. **(9)**

WEB INTERFACE DESIGN

Designing Web Interfaces - Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 5th Edition, Pearson, Education 2004.*
2. *Brian Fling, "Mobile Design and Development", First Edition,O'Reilly Media Inc., 2009.*
3. *Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009*

17MDC94 - HUMAN COMPUTER INTERFACE AND INTERACTION LAB

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC38, 17MDC53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyse and evaluate interaction with computer artifacts from human perspective*
- *Investigate and implement human centered models for usability, utility and satisfaction.*
- *Develop basic prototypes with a range of interaction styles and technologies*

CONCEPTS TO BE COVERED

1. Study the trouble of interacting with machines - Redesign interfaces of home appliances.
2. Design a system based on user-centered approach for any home appliance.
3. Study the features of various handheld systems and computer system.
4. Study of the principles of good screen design.
5. Implement screen design for home appliance
6. Redesign existing Graphical User Interface with screen complexity
7. Design Web User Interface based on any standard theory.
8. Implementation of Different Kinds of Menus
9. Implementation of Different Kinds of Windows
10. Design a system with proper guidelines for icons

*Design and implementation of the above systems to be done for desktop, web based, and handheld interfaces as applicable.

17MDC95 - MINOR PROJECT - DECISION TOOL DEVELOPMENT

L	T	P	C
0	0	8	4

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Investigate the business problem in detail*
- *Identify the logical and ordered process to address all the critical elements of the business problem*
- *Analyze various alternatives and select the best alternative for the problem*
- *Develop the decision tool with the help of the analysis*

Effectiveness in managing the business decision making will ultimately determine the success of the company. But this is a problem for companies of all sizes particularly with the companies that are growing rapidly. At this point a clear mechanism for managing, communicating and confirming decision implementation is essential. Hence this minor project concentrates on developing a decision tool for the Chosen business process.

In this minor project students have to :

- Choose a business problem and develop a decision tool for to address the same.

17MDC96 - BUSINESS ETHICS

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Understand the inhereent conflicts in being ethical*
- *Analyse the ethical dilemmas in common business situations and the ways to solve them.*
- *Broaden the understanding of the way to act rightly in different business situations*
- *Learn to commit to mutual ethical treatment of the human person and do ethical business and ethical leadership.*
- *Make ethical decisions effectivelu and decisively based on ethical thinking and decision making frameworks.*

UNIT I

Introduction to Ethics - Moral Development in human theories and Concepts- Definitions of ethics- theories of Ethics and Ethics Projects -Case Study. **(6)**

UNIT II

Decision Making Model : Ethics as Making Decisions and Choices - Decision Making frameworks-Conflicts and Ethical Dilemmas - Moral and Ethical dilemmas-Case Study. **(6)**

UNIT III

Ethics and Business : A sense of Business Ethics - Ethics and International Business - Ethics issues beyond borders- Ethics and economics: Ethical concerns of economic individuals and societies. **(6)**

UNIT IV

Business Disciplines : Ethics of Marketing and advertising - Ethics of Finance and accounting- Ethics of HR and related aspects-Production and related issues -Ethics of IT. **(6)**

UNIT V

Ethics and Environment : Environmental Ethics awareness-Business and Social Responsibility-Business response to environmental problems and ethics-International standards-Global Impact. **(6)**

Total : 30

REFERENCE BOOKS

1. *William. H. Shaw, "Business Ethics", Cengage Advantage Books, 2013.*
2. *Stephen. M. Byars and Kurt Stanberry, "Business Ethices", 2018.*
3. *Das Gupta, Anandha, "Business Ethics", Springer, 2014.*
4. *Denis Collins, "Business Ethics", Second Edition, Sage Publications, 2018*

17MDC101 - PROJECT WORK AND VIVA VOCE - II

L	T	P	C
			18

PRE-REQUISITES

Should have undergone all courses

ASSESSMENT : PRESENTATION AND VIVA VOCE

COURSE OUTCOME

- *Perform quantitative and qualitative data analytics in functional areas of business*
- *Analyze business problems using mathematical and statistical modeling and enable data driven decision making.*
- *Analyze the issues in software solutions*
- *Develop enterprise applications applying software engineering principles and business domain knowledge*
- *Visualize and infer meaningful insights to facilitate strategic and operational decisions*
- *Apply and demonstrate software development standards in the software industry*
- *Work in a team to develop solutions for real time applications and solve research issues*

MANAGEMENT STREAM - FINANCE

Course Code	Course Name
17MDCE01	Security Analysis And Portfolio Management
17MDCE02	Equity Valuation
17MDCE03	Derivatives And Risk Management
17MDCE04	Credit Risk Analytics And Management

17MDCE01 - SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the various investment alternatives available and select the best security for investment*
- *Analyse the nuances of Stock Market operations*
- *Evaluate the economy, industry and company to select the instrument for investment*
- *Assess the trend patterns for investment in securities*
- *Practice the techniques involved in analysing upon purchase or sales of secuirities.*

INVESTMENT SETTING : Financial and Economic meaning of investment - Characteristics and objectives of investment - Types of investment - Investment alternatives choice and evaluation - Risk and return concepts. **(9)**

SECURITIES MARKETS : Financial Market - Segments - Types - Participants in financial market - Regulatory environment - Primary market - Methods of floating new issues, Book building - Role of Primary market - Regulation of primary market - Stock exchanges in India - BSE, OTCEI, NSE, ISE and Regulation of Stock exchanges - Trading system in stock exchanges - SEBI. **(9)**

FUNDAMENTAL ANALYSIS : Economic analysis: Economic Forecasting an Stock investment decisions. Industry Analysis : Industry classification - Industry Life Cycle. Company Analysis: Measuring Earnings - Forecasting Earnings - Applied Valuation Techniques - Graham and Dodd investor ratios. **(9)**

TECHNICAL ANALYSIS : Fundamental Vs Technical Analysis - Charting methods - Market Indicators: Trend, Trend reversals, Patterns, Moving average, Exponential Moving average - Oscillators - Market Indicators - Efficient Market Theory. **(9)**

PORTFOLIO MANAGEMENT : Portfolio Analysis - Portfolio Selection - Portfolio Revision - Portfolio Evaluation. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Prasanna Chandra, "Investment Analysis and Portfolio Management", Tata Mc.Graw Hill, 2011.*
2. *Donald. E. Fischer and Ronald. J. Jordan, "Security Analysis and Portfolio Management", PHI learning, New Delhi, 8th Edition, 2011.*
3. *Bhalla.V.K, "Investment Management", Sultan Chand and Company Ltd, 2012.*
4. *Kevin.S, "Security Analysis and Portfolio Management", PHI Learning,2012.*

17MDCE02 - EQUITY VALUATION

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess valuation and intrinsic value and explain sources of perceived mispricing;*
- *Evaluate definitions of value and justify which definition of value is most relevant to public company valuation;*
- *Apply techniques learned in the course as these are being used in practice by stock market participants .*
- *Analyse the environmental context of the company being valued.*
- *Apply critically various theories of valuation and forecasting.*

Introduction to Valuation and Common Valuation Methodologies - Why Valuation, Various Methods of Valuation, Introduction to Discounted Cash Flow Valuations, Relative Valuations and Other Methods, Advantages and Disadvantages of the various Methods. **(9)**

Discounted Cash Flow Valuation - Introduction to Dividend Discount Model, Free Cash Flow to Firm and Free Cash Flow to Equity Model, Cost of Equity, Cost of Capital, Practical Methods of Cost of Capital Calculations, Interpretation of Capital Asset Pricing Model and other methods of calculating cost of equity, Cash Flow Calculations and Interpretations, Usage of methods based on industries and companies **(9)**

Relative Valuations - Relative Valuation Metrics - Price to Earnings Ratio, Price to Book Ratio, Price to Sales Ratio, Enterprise Value ratios, Exercise on Relative Valuation using Banking Sector. **(9)**

Advanced Valuation Techniques - Introduction to distressed company valuation, Valuation and its applications in Mergers and Acquisitions, Transaction Comparable Methods. **(9)**

Valuation Exercises - Valuation model building using Microsoft Excel for a services company in India, Valuation model building using Microsoft Excel for a manufacturing company in India, including concepts of DCF Valuations and Relative Valuations. Other Exercises - Students to build a detailed model on their own **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Aswath Damodaran, "Investment Valuation", John Wiley & Sons, Inc., 3rd edition, 2012.*
2. *Benjamin Graham David Dodd, "Security Analysis", Sixth Edition, 2008.*
3. *John D Stowe et al., "Equity Asset Valuation", John Wiley & Sons, Inc., 2nd edition, 2007.*
4. *James Valentine, "Best Practices for Equity Research Analysts: Essentials for Buy-Side and Sell-Side Analysts", Mc Graw Hill, 2011.*

17MDCE03 - DERIVATIVES AND RISK MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC43, 17MDCE111

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand the operations of Derivatives market.*
- *Analyse and price diverse derivatives products to generate an optimal risk management strategy.*
- *Demonstrate critical thinking, analytical and problem solving skills in the context of derivatives pricing and hedging practice*
- *Understand the procedures followed in the binomial model Black-scholes model in fixing option prices.*
- *Demonstrate an understanding of pricing forwards, futures and option contracts.*

UNIT I : Introduction to derivatives : Derivative markets and instruments, underlying asset, concepts in derivative markets, linkages between spot and derivative markets, Role of Derivative markets. Growth and Development of derivative markets: commodity derivatives, financial derivatives, globalization of derivatives and derivatives in India, Users of derivatives. **(9)**

UNIT II : Structure of Forward and Future contracts : Development of Forward and Future markets, Over the Counter and Futures exchanges, Mechanics of future trading, Futures price quotations, Types of future contracts, Transaction costs. Principles of Pricing : Generic carry arbitrage, carry arbitrage with cash flows. Future arbitrage strategies: short term, intermediate and long term interest rate arbitrage, Stock index arbitrage, Foreign exchange arbitrage. **(9)**

UNIT III : Structure of option markets: Development of options markets, Call options, Put options, Over the Counter option markets and organized exchanges, Option Traders, Mechanics of trading and Types of options. Principles of Pricing: Notation and Terminology, Principles of call option Pricing and Principles of put option pricing. Option Pricing Models: Option Greeks, Binomial model and Black-Scholes option pricing model. **(9)**

UNIT IV : Risk Management applications of option Strategies : Notation and terminology, Stock Transactions, Call option Transactions, Put option Transactions, Covered Call, Productive Put, Synthetic puts and calls. Advanced Risk Management applications of option Strategies: Option spreads, Collar, Butterfly spread, Straddles and Strangle. **(9)**

UNIT V : Interest Rate Swaps : Structure, Valuation, Strategies. Currency swaps: Structure, Valuation, Strategies. Equity swaps: Structure, Valuation, Strategies, Caps, Floor and Swaptions: LM Model and SM Model **(9)**

Total : 45

REFERENCE BOOKS

1. *Don M.Chance and Robert Brooks, "Derivatives and Risk Management Basics", 5th Edition, South-Western Cengage Learning, USA, 2011.*
2. *Jayanth Rama Varma, "Derivatives and Risk Management", 3rd Edition, Tata McGraw Hill, New Delhi, 2010.*
3. *Schwesernotes, CFA Level 1 Book 5 : "Fixed Income, Derivatives and Alternatives Investments", Kaplan Inc., USA, 2014.*
4. *Sundaram Janakiramanan, "Derivatives and Risk Management", Pearson, 2011.*

17MDCE04 - CREDIT RISK ANALYTICS AND MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC32, 17MDC43

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the different types of credit risk and how they arise in a financial institution's various activities.*
- *Understand how credit risk can be quantified, monitored and controlled, exploring the role of credit portfolio management tools such as collateral, documentation and credit derivatives*
- *Apply best practice tools and techniques for fundamental credit analysis .*
- *Understanding of businesses, their borrowing needs, making robust risk assessments and making good credit decisions.*
- *Make detailed credit analysis of any company (finance/ non-finance)*

Meaning of Credit - Risk of Credit - Credit Market -Advantages and disadvantages of Credit - Credit Research and analysis - Importance of Credit Research. **(9)**

Rating Methodology and players - Different credit rating companies and credit rating scales - Risks in Fixed income and Terminology - Understanding auditors report - Understanding Management Risk - Debt Schedule understanding and interpretation Self sustainable understanding and interpretation - Bank Basel Report. **(9)**

Advance Ratios for Credit analysis : Cash flow, Debt specific, Liquidity - Adjustment in ratios -Credit Rating companies Procedures for comparing financials - CRISIL, ICRA, CARE - Additional comparison between CRISIL,ICRA and CARE. **(9)**

Term sheet understanding for SME and Education rating - SME rating process - Content and structure of credit rating report - Retail credit assessment - Working capital assessment (fund and non-fund based) - Cash flow/fund flow analysis - Credit Pricing. **(9)**

Rating Methodology of different sector : Banking sector, Infrastructure sector,Two wheeler sector and other sectors. **(9)**

Total : 45

REFERENCE BOOKS:

1. *Ken Brown and Peter Moles, "Credit Risk Management", Edin burgh Business School, Heriot Watt University, 2013.*
2. *Ciby Joseph, "Advanced Credit Risk Analysis and Management", Wiley, First Edition, 2013.*
3. *Arnold Ziegel, "Fundamentals of credit and Credit analysis", Create Space Independant Publishing, 2015.*
4. *Andrew Fight, "Credit Risk Management", Elsevier Butterworth-Heinemann, 2004.*
5. *Harold Scheule, Daniel Rosch and Bart Baesens, "Credit Risk Analysis - The R Companion", Wiley Publishers, 2016.*

MANAGEMENT STREAM - MARKETING

Course Code	Course Name
17MDCE11	Consumer Behaviour
17MDCE12	Services Marketing
17MDCE13	Customer Relationship Management
17MDCE14	Brand Management

17MDCE11 - CONSUMER BEHAVIOUR

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the major influences in consumer behaviour*
- *Distinguish between different consumer behaviour influences and their relationships*
- *Establish the relevance of consumer behaviour theories and concepts to marketing decisions*
- *Recognise social and ethical implications of marketing actions on consumer behaviour*
- *Use most appropriate techniques to apply market solutions*

Introduction to Consumer Behavior : Definition, Concepts, Model. Consumer Motivation: Dynamics of Motivation, Types and System of Needs, Measurement of Motives. Consumer Personality: Theories, Personality and understanding Consumer Behaviour, Brand Personality, Self and Self-image -Predicting consumer behavior with data analytics. **(9)**

Consumer Perception : Sensory dynamics, Elements, Consumer Imagery. Consumer Learning: Elements of Consumer learning, Behavioural learning, Information Processing and Cognitive Learning, Consumer Involvement and Passive Learning, Outcomes and Measures of Consumer learning - Understand consumer perception using marketing anaytics. **(9)**

Consumer Attitude : Concept, Structural Models of Attitude, Attitude Formation, Strategies of Attitude Change, Cognitive Dissonance Theory, Attribution Theory - Analyzing consumer attitude using Marketing analytics. **(9)**

Social Class : Socialization and Roles of family members, Family Decision Making, Family lifecycle, Social Class, Measurement of Social Class. Influence of culture on Consumer Behavior: Dynamics of Culture, Indian Core Values. **(9)**

Diffusion of Innovations : Diffusion Process, Adoption Process, A profile of the Consumer Innovator. Marketing Ethics and Social Responsibility: Exploitive Targeting, Manipulating Consumers, Social Responsibility. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Leon G. Schiffman, Leslie Lazar Kanuk& S. Ramesh Kumar, "Consumer Behaviour", 10th Edition, Pearson Education, New Delhi, 2010.*
2. *David L. Loudon & Albert J. Della Bitta, "Consumer Behaviour", 4th Edition, Tata McGraw Hill: New Delhi, 2013.*
3. *Del I Hawkins, "Consumer Behaviour", 12th Edition, Tata McGraw Hill: New Delhi, 2013.*
4. *Roger D Blackwell, Paul WMiniard and James F Engel, "Consumer Behaviour", 10th Edition, Thomson/ South-Western College Publication, Ohio, 2005.*

17MDCE12 - SERVICES MARKETING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Identify the special management issues and unique challenges involved in marketing and managing services*
- *Assess the expectations of customers and know how to translate this knowledge into genuine value for customers*
- *Interpret service behaviour and service consumption in the light of service-dominant marketing logic and articulate the outcome to service marketing management*
- *Appreciate, modify, and/or extend new theories and concepts pertaining to explaining the characteristics of customers' purchasing and consumption behaviour of services and service firms' marketing behaviour*
- *Apply new approaches to managing customer satisfaction and loyalty*

Introduction to Services : Introduction and Growth of service sector, Characteristics of services, Classification of Services, Service Marketing mix.Service Quality: SERVQUAL dimensions, the gaps Model of Service Quality - Case Study. **(9)**

Focus on the consumer : Consumer Behaviour in Services: Types of consumer expectations, Zone of tolerance. Consumer Expectations of service: Factors influencing customer expectations of service. Customer Perceptions of services: Customer perceptions, Customer satisfaction, Service Encounters- Case Study. **(9)**

Understanding Customer requirements : Building Customer relationships: Relationship Marketing, Relationship value of customers, Relationship Development Strategies. Service Recovery: Service failure and Recovery, Customers' response to service failures, Services Recovery strategies, Service Guarantees- Case Study. **(9)**

Service design and Standards : Service Blueprinting: Service blueprint and its components. Physical Evidence and servicescape: Types of Servicescapes, roles of Servicescape, Guidelines for Physical Evidence strategy. Employee role in Service Industry: Boundary spanning roles, Strategies for delivering service quality through people- Case Study. **(9)**

Delivering Service through intermediaries and electronic channels : Types ofChannels. Managing demand and capacity: Strategies for matching capacity and demand. Integrated service marketing communications: Categories of strategies to match service promises with delivery. Pricing of services: Approaches to Pricing Strategies, Pricing Strategies- Case Study. **(9)**

TOTAL : 45

TEXT BOOK

1. *Zeithaml. A. Valarie, Gremler D Dwayne, Bitner Jo Mary, Ajay Pandit, "Services Marketing- Integrating customer focus across the firm", 4th edition, Tata McGraw-Hill Publishing, New Delhi.*

REFERENCES BOOKS

1. *Lovelock Christopher, JochenWirtz and JayantaChatterjee, "Services Marketing", Pearson Education: New Delhi, 2011.*
2. *Woodruffe Helen, "Services Marketing", McMillan: New Delhi, 2003.*
3. *C Bhattacharjee, "Services Management", Excel Books: New Delhi, 2006.*
4. *Jha S.M., Services Marketing, Himalaya: Mumbai.*
5. *Ravi Shanker, "Services Marketing", Excel Books: New Delhi, 2008.*

17MDCE13 - CUSTOMER RELATIONSHIP MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Critically review and interpret the theoretical aspects of CRM across the main areas of Sales, services and marketing.*
- *Investigate, analyse, demonstrate and present the salient aspects of a CRM implementation in work related environment*
- *Evaluate internal data about customers and analyse for decision making*
- *Conduct data analysis and generate insights about how to better meet the needs of target segments and individual customers*
- *Deliver a marketing mix tailored to the needs and interests of target segments and individual customers.*

CRM concepts - Acquiring customers, - Customer loyalty and optimizing customer relationships - CRM defined - success factors, the three levels of Service/ Sales Profiling - Service Level Agreements (SLAs), creating and managing effective SLAs-Case Study. **(9)**

CRM in Marketing - One-to-one Relationship Marketing - Cross Selling &Up Selling - Customer Retention, Behaviour Prediction - Customer Profitability & Value Modeling, - Channel Optimization - Event-based marketing.

CRM and Customer Service - The Call Centre, Call Scripting - Customer Satisfaction Measurement-Case Study. **(9)**

Sales Force Automation - Sales Process, Activity, Contact- Lead and Knowledge Management - Field Force Automation. - CRM links in e-Business - E-Commerce and Customer Relationships on the Internet - Enterprise Resource Planning (ERP), - Supply Chain Management (SCM), - Supplier Relationship Management (SRM), - Partner relationship Management (PRM)-Case Study. **(9)**

Analytical CRM - Managing and sharing customer data - Customer information databases - Ethics and legalities of data use-Customer Relationship Analytics in customer service evaluation and supply chain management. **(9)**

CRM Implementation - Defining success factors - Preparing a business plan requirements, justification and processes. - Choosing CRM tools - Defining functionalities - Homegrown versus out-sourced approaches - Managing customer relationships - conflict, complacency, Resetting the CRM strategy. Selling CRM internally - CRM development Team - Scoping and prioritizing - Development and delivery - Measurement-Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Alok KumarRai, "Customer Relationship Management Concept & Cases", Prentice Hall of India Private Limited, New Delhi. 2011*
2. *S. Shanmugasundaram, "Customer Relationship Management", Prentice Hall of India Private Limited, New Delhi, 2008*
3. *Kaushik Mukherjee, "Customer Relationship Management", Prentice Hall of India Private Limited, New Delhi, 2008*
4. *Jagdish Seth, et al, "Customer Relationship Management"*
5. *V. Kumar & Werner J., "Customer Relationship Management", Willey India, 2008*

17MDCE14 - BRAND MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Demonstrate knowledge of the nature and processes of branding and brand management.*
- *Evaluate the scope of brand management activity across the overall organisational context and analyse how it relates to other business areas.*
- *Appraise the key issues in managing a brand portfolio and making strategic brand decisions*
- *Formualte and justify brand development decisions*
- *Analyse and Discuss contemporary brand related problems and develop appropriate strategies and initiatives.*

INTRODUCTION

Basics Understanding of Brands - Definitions - Branding Concepts - Functions of Brand -Significance of Brands - Different Types of Brands - Co branding - Store brands-Case Study. **(9)**

BRAND STRATEGIES

Strategic Brand Management process - Building a strong brand - Brand positioning -Establishing Brand values - Brand vision - Brand Elements - Branding for Global Markets -Competing with foreign brands-Analytics in Brand marketing strategy. **(9)**

BRAND COMMUNICATIONS

Brand image Building - Brand Loyalty programmes - Brand Promotion Methods - Role of Brand ambassadors, celebraties - On line Brand Promotions-Case Study. **(9)**

BRAND EXTENSION

Brand Adoption Practices - Different type of brand extension - Factors influencing Decision for extension - Re-branding and re-launching-Case Study. **(9)**

BRAND PERFORMANCE

Measuring Brand Performance - Brand Equity Management - Global Branding strategies -Brand Audit - Brand Equity Measurement - Brand Leverage -Role of Brand Managers- Branding challenges & opportunities - Case Studies. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Kevin Lane Keller, "Strategic Brand Management: Building, Measuring and Managing", Prentice Hall, 2012.*
2. *Moorthi.YLR, "Brand Management", Vikas Publishing House, 1st Edition, 2012.*
3. *LanBatey, "Asain Branding - A Great way to fly", PHI, Singapore, 2002.*
4. *Paul Tmepoal, "Branding in Asia", John Willy, 2000.*
5. *Ramesh Kumar, "Managing Indian Brands", Vikas Publication, India, 2002.*
6. *Jagdeep Kapoor, "Brandex", Biztranza, India, 2005*

MANAGEMENT STREAM - HR

Course Code	Course Name
17MDCE21	Strategic Human Resource Management
17MDCE22	Organisational Development
17MDCE23	Performance Management
17MDCE24	Compensation Management

17MDCE21 - STRATEGIC HUMAN RESOURCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC51

ASSESSMENT : THEORY

COURSE OUTCOME

- *Evaluate the differing strategic contributions of particular HR disciplines*
- *Analyse organisational and human resource strategies, and perform a strategic gap analysis*
- *Measure and quantify the contribution of HR activity at an organisational level*
- *Align HR activities with overall organisational strategy by developing, planning and applying contextualised strategic solutions to specific organisational human resource challenges*
- *Gain the ability to manage global HR and manage and train the international employees.*

Strategic Role of HRM - Planning and Implementing Strategic HR Policies - HR Strategies to increase firm performance - Case Study. **(9)**

Investment perspectives of HR - Investment Considerations - Investment in Training and Development - Investment Practices for improved Retention - Investments Job Secure work courses - Non traditional investment approaches - Case Study. **(9)**

Managing Strategic Organisational Renewal - Managing change and OD - Instituting TQM Programmes - Creating Team Based Organisations - HR and BPR - Flexible work arrangement - Case Study **(9)**

Establishing Strategic Pay plans - Determining periods - Establishing Periods - Pricing Managerial and Professional Jobs - Compensation trends - Objectives of international compensation - Approaches to international compensation - Issues related to double taxation - Case Study. **(9)**

Managing Global Human Resources - HR and the internationalization of business - Improving international assignments through selections - Training and maintaining international employees - Developing international staff and Multinational teams - Strategic alliances -Sustainable global competitive advantage - Location of production facilities - Repatriation process- Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Gary Dessler, "Human Resource Management", PHI, New Delhi, 2003.*
2. *Charles R. Greer, "Strategic Human Resource Management", Pearson Education, 2003.*
3. *Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy, "Managing Human Resources", PHI, 2001.*
4. *Peter J. Dowling, Denice E. Welch, Randall S. Schuler, "International Human Resource Management", Thomson South-Western, 2002.*

17MDCE22 - ORGANISATIONAL DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Assess the organisation development process from a historical, theoretical and practical perspective.*
- *Analyse the various organisation development practices, models, and approaches.*
- *Evaluate the value of organisation development interventions to business performance and productivity.*
- *Analyse the value of human resource intervention to the organisational development*
- *Assess the impact of technology on the organisational development*

Organisational Development - An introduction : Organisational Development - Meaning and Definition, History of OD, Relevance of Organisational Development for Managers, Characteristics of OD, Assumptions of OD. Change Process and Models: Organisational Change, Strategies for Change, Theories of Planned Change (Lewin's change model, Action research model, the positive model), Action Research as a Process, Resistance to Change- Case Study. **(9)**

Role of OD Practitioner : OD Practitioner, Role of OD Professional in Organisations, Competencies Required for an OD Professional, Scope of the Role of an OD Professional.Process of OD: Process of OD, Components of OD program, OD program phases, Making an Entry, Developing Contract, Launch, Situational Evaluation, Closure- Case Study. **(9)**

Designing Interventions : OD Interventions, Characteristics of OD Interventions, Levels of Diagnosis in Organisations, OD Map, Factors Affecting Success of Interventions. Human Process Interventions: Introduction, Team Development Interventions, Interpersonal Development Interventions. Human Resource Interventions: HRM Interventions, Goal Setting, Performance Appraisal, Reward Systems, Career Planning and Development, Managing Workforce Diversity, Employee Wellness- Case Study. **(9)**

Structural Interventions : Socio-Technical Systems, Techno-Structural Interventions, Physical Settings and OD, Types of Techno-Structural Interventions. Strategic Interventions: Integrated Strategic Change, Trans-organisation Development, Merger and Acquisition Integration, Culture Change, Self-Designing Organisations, Organisation Learning and Knowledge Management, Confrontation Meetings, System 4 Management, Learning Organisations- Case Study. **(9)**

Technology and OD : Technology & OD: Basic Concept, Impact of Technology in Organisations, Benefits of Using Technology in OD, Guidelines for Integrating Technology in OD Interventions, Tools used in ODIssues Faced in OD: Introduction, Issues Related to Client Relationships, Power, Politics and Organisational Development. Evaluating OD interventions: Evaluation, Importance of Evaluating Interventions, Types of Evaluation, Methods of Evaluating Interventions- Case Study. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Bewnet, Roger cd, "Improving Training Effectiveness", Aldershot, Gower 1988.*
2. *Buckley R & Caple, Jim, "The Theory & Practice of Training", London, Kogan & Page 1995.*
3. *Lynton R & Pareek U, "Training to Development", New Delhi, Vistaar, 2nd Edition, 1990.*
4. *Pepper, Allan D, "Managing the Organisational Development Function", Aldershot, Gower, 1984.*
5. *Rae L etc., "Hon to Measure Training Effectiveness", Aldershot, Gower, 1986.*
6. *Reid M.A. etc., "Training interventions, Managing Employee Development", London IPM, 3rd Edition, 1992.*
7. *Serge P "The Fifth Discipline: The Art and Practice of the Learning Organization", London Century, 1992.*
8. *Huse.F.E. and Cummings.T.C, "Organisational Development and Change", West New York, 1985.*

17MDCE23 - PERFORMANCE MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design an organisation's performance management process that is compliant with law and supports organisational mission and strategy.*
- *Define attributes of effective performance management systems.*
- *Devise and sustain arguments for using appropriate performance management techniques, rewards and sanctions to improve performance.*
- *Identify the necessary characteristics of accurate performance management tools.*
- *Plan effective performance management policies and practices to improve organisational and employee performance*

Introduction to Performance Management : Definition of performance evaluation-Evolution of Performance management-Definitions and differentiation of terms related to performance management- Importance of performance management-Linkage of performance management to other HR processes-Case Study. **(9)**

An Overview of Performance Management : Aim and Purpose of Performance Management-Employee engagement and performance management - Principles of Performance management - Overview of performance management as a system - Dimensions of Performance management-Case Study. **(9)**

Theoretical Framework of Performance Management : Goal Theory, Control theory, Social Cognitive theory, Organisational justice theory and its applications in Performance Management-Case Study. **(9)**

Process of Performance Management : Overview of performance management process-Performance management process-Performance management planning process-Mid-cycle review process-End cycle review process-Performance management cycle at a glance. Planning and Development: Introduction - Performance management planning - The planning process-Performance agreement-Drawing up the Plan-Evaluating the Performance Planning process-Case Study. **(9)**

Mechanics of Performance Management Planning and Documentation : The need for structure and documentation - Manager's responsibility in performance management planning and creation of performance management-Performance management process through automation-Issues in Performance management-Predictive analytics in identifying and analyzing lead and lag indicators for performance management. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Herman Aguinis, "Performance Management", Pearson Publication, Third Edition, 2013.*
2. *R.K.Sahu, "Performance Management System", Excel Books, 2009.*
3. *Elaine.D.Pulakees, "SHRM Foundation".*
4. *Linda Ashdown, "Performance Management", 2014.*
5. *PremChandha, "Performance Management", Macmillan Insia, New Delhi, 2003.*
6. *Michael Armstrong and Angela Baron, "Performance Management:The New Realities", Jaico Publishing House, New Delhi, 2002.*
7. *T.V. Rao, "Appraising and Developing Managerial Performance", Excel Books, 2003.*

17MDCE24 - COMPENSATION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC52

ASSESSMENT : THEORY

COURSE OUTCOME

- *To promote knowledge in the issues related to the compensation in the organisation.*
- *To analyse the pay relationship with job, skills, competencies in an organisation*
- *To evaluate the legal framework and the pay structure of the organisation in comparison to the competitors.*
- *To get a clear idea in fixing the remuneration principles in the company.*
- *To understand the financial and non-financial compensation fixed for executives in an organization*

UNIT I : Introduction : Compensation Defined, Goals of Compensation System, Compensation Strategy Monetary & Non-Monetary Rewards, Intrinsic Rewards Cafeteria Style Compensation, Fringe Benefits and Supplementary Compensation-Case Study **(9)**

UNIT II : Internal Alignment : Definition of internal alignment, Internal pay Structures, Strategic choices in internal alignment design, choosing the best internal structure - Job evaluation: Major decisions in job evaluation, Job Evaluation Methods, Final result-Person-based structures: Salary Slabs, Flexible Structure, Salary Trends-Case Study. **(9)**

UNIT III : Determining External Competitiveness : Definition of Competitiveness, Factors influencing compensation level - Legal framework: Payment of Wages Act, 1936, Minimum Wages Act, 1948, Payment of Bonus Act, 1965, Equal Remuneration Act, 1976-Case Study. **(9)**

UNIT IV : Reward and Compensation Strategies : Performance based pay, Skill based pay, Team based pay,Broad banding, Profit sharing -Compensation& Payroll: Basic, HRA, Variable pay, Designing PF Plans -Case Study. **(9)**

UNIT V : Executive Compensation : Concepts, components, incentives, executive compensation in Indian context - Leave Policy: Scope, Types, Process-Personal income tax implications of salary: sec 88, 54E, 80C, Companies Act provisions relating to remuneration for senior executives-Analytics in identifying Lead and Lag indicators for compensation management. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *C.B. Mamoria and S.V. Gankar, "Personnel Management", Himalaya Publishing House, Mumbai, Twenty-fifth Edition, 2005*
2. *Tripathi, P. C. 1995, "Personnel Management and Industrial Relations", Sultan Chand : New Delhi*
3. *Venkatratnam, C.S. (2002). "Rethinking Rewards and Incentive Management", Excel:New Delhi.*

MANAGEMENT STREAM - OPERATIONS & LOGISTICS

Course Code	Course Name
17MDCE31	Total Quality Management
17MDCE32	Logistics Strategy and Planning
17MDCE33	Supply Chain Management
17MDCE34	Warehouse and Distribution Management

17MDCE31 - TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop an understanding on quality management philosophies and frameworks*
- *Gain an in-depth knowledge on various tools and techniques of quality management.*
- *Learn the applications of quality tools and techniques in both manufacturing and service industry*
- *Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implement able solutions to those.*
- *Design the quality framework for a company*

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality - Case Study. **(9)**

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating - Case Study. **(9)**

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types- Case Study. **(9)**

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures - Case Study **(9)**

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, QualityAuditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors - Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Senthil Arasu.B and Praveen Paul. J, "Total Quality Management", Scitech Publications (India) PVT Ltd, Second Edition, 2006.*
2. *Dale.H.Besterfield, et al, "Total Quality Management", Pearson Edn, Asia, Third Edition, Indian Reprint, 2006.*
3. *James. R. Evans and William. M. Lindsay, "The Management and Control of Quality", Cengage Learning, Eighth Edition, 2012.*
4. *Suganthi. L and Anand Samuel, "Total Quality Management", Prentice Hall(India) Pvt Ltd, 2006.*

17MDCE32 - LOGISTICS STRATEGY AND PLANNING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Design a logistical planning and Strategy framework*
- *Analyse and design the optimal logistics customer services levels*
- *Compute optimal batch sizes and propose optimal transport routes*
- *Assess different modes of transportation and inter-modals*
- *Design and allocate storage location for products in the warehouse*

Introduction to Logistics : Introduction to Logistics - Scope of logistics in business, Logistics and Supply Chain Management, Core and support activities of logistics; Logistical integration hierarchy; Integrated Logistics; Operating objectives; Barriers to internal integration; Logistical performance cycles; Supply chain relationships - Channel participants, Channel structure, Basic functions, Risk, power and leadership-Case Study. **(9)**

Logistics Systems Design : Logistics system design -Logistics reengineering, Logistical environmental assessment, Time based logistics, Anticipatory and Response based strategies, Alternative strategies, Logistical operational arrangements, Time based control techniques; Integration theory - Location structure, Transportation economies, Inventory economies, Formulating logistics strategy-Case Study. **(9)**

Logistics Strategy and Planning : Logistics strategy and planning - Logistics planning triangle, Network appraisal; Guidelines for strategy formulation - Total cost concept, Setting customer service level, Setting number of warehouses in logistics system, Setting safety stock levels, Differential distribution, Postponement, Consolidation, Selecting proper channel strategy-Case Study. **(9)**

Inventory, Purchasing and Location Decisions : Inventory and purchasing decisions; Multi facility location problems - Exact method, Heuristic methods, other methods; Logistics planning and design - Feasibility analysis, Project planning, Assumptions and data collection, Analysis, Development of recommendation, Implementation-Case Study. **(9)**

Logistics planning and design : Planning and design techniques - Logistics adhoc analysis, Location analysis, Inventory analysis, Transportation analysis-Logistics Analytics. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Bowersox & Closs, "Logistical Management", McGraw-Hill Companies, 1996.*
2. *Muthu Mathirajan, Chandrasekharan Rajendran, Sowmyanarayanan Sadagopan, Arunachalam Ravindran and Parasuram Balasubramanion, "Analytics in Operations/Supply Chain Management", I.K. International Publishing House Pvt Ltd., 2015.*
3. *R.H. Ballou, "Business Logistics Management", Prentice-Hall International, 2004.*
4. *David J Bloomberg, "Logistics", Pearson Education, 1st Ed, 2015.*
5. *Ganapathi SL, Nandhi SK, "Logistics Management", Oxford University Press India, 2015.*

17MDCE33 - SUPPLY CHAIN MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand fundamental supply chain management concepts*
- *Evaluate and manage an effective supply chain*
- *Align the management of supply chain with corporate goals and strategies*
- *Analyse and improve supply chain process*
- *Understand the importance of the supply chain analytics and optimization*

Concepts of Supply Chain : Understanding supply chains - Supply chain decisions - Enablers and Drivers of Supply Chain Performance - Assessing and Managing Supply chain Performance - Supply chain metrics and Financial metrics relationship - Supply chain Processes and Strategies - Importance of Supply Chain Management-Service and manufacturing supply chain dynamics - Manufacturing supply chains - Bullwhip effect. **(9)**

Forecasting Drivers of Supply chain Performance : Forecasting introduction - Framework for a forecast system - Choosing right forecasting technique - Judgment methods (Composite Forecasts, Surveys, Delphi Method, Scenario Building, Technology Forecasting, Forecast by Analogy) - Causal methods (Regression Analysis -Linear & Non-Linear Regression, Econometrics) - Time series analysis (Autoregressive Moving Average (ARMA), Exponential Smoothing, Extrapolation, Linear Prediction, Trend Estimation, Growth Curve, Box-Jenkins Approach) - CPFR. **(9)**

Inventory management methods in supply chain : Decision framework for inventory management - Preliminary modelling, Two critical and ABC analysis -Single item, Single period problem - Single item, multi period problem - Multi item inventory models - Multi-echelon inventory system. Transportation Decision in Supply Chain: Motor carrier freight - Truck load mode - Steeping back - Building A Rate Model using LTL service - Rail and Cargo. Location and Distribution Decision in Supply Chain : Modelling with binary variables - Supply Chain network optimization - Risk pooling - Continuous location models: Gravity, iterative method - Multiple facility location. **(9)**

Supply Chain Processes and Strategies : Integrated supply chains design - Customer relationship process - Order fulfillment process - Supplier relationship process - Supply chain strategies - Strategic focus - Mass customization - Lean supply chains - Outsourcing and offshoring - Virtual supply chains.Resource planning and scheduling: Enterprise resource planning - Planning and control systems for manufacturers - Materials requirement planning - Drum - Buffer - Rope system - Scheduling - Scheduling service and manufacturing processes - Scheduling customer demand - Scheduling employees - Operations scheduling-Analytics for sequencing and scheduling. **(9)**

Supply Chain Analytics : Understanding and defining supply chain analytics- Importance of analytics in supply chain management - Supply chain analytics in the flow involving material, money, information and ownership - Key issues in supply chain analytics. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Ravi Ravindran.A and Donald.P.Warsing, "Supply Chain Engineering Models and Applications", CRC press:Taylor and Francis Group*
2. *Sunil Chopra, Peter Meindl & D.V. Kalra, "Supply Chain Management: Strategy, Planning and Operation", Pearson Education; 5th Ed.. 2012*

3. *Lee Krajewski, Larry P. Ritzman, Malhotra, "Operations Management 8e", Pearson Education; 11th edition2015*
4. *Christopher Martin, "Logistics and Supply Chain Management", Pearson Education Asia,2002.*
5. *David Simchi-Levi, Ravi Shankar, "Designing and Managing Supply Chain concepts, Strategies and Case Studies", McGraw Hill Publication, 3rd Edition, 2011.*
6. *Janat Shah, "Supply Chain Management - Text and Cases", Pearson Education, 2nd Edition, 2016.*

17MDCE34 - WAREHOUSE AND DISTRIBUTION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC44

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the concepts and principles used in warehousing and distribution management.*
- *To analyse the various operational activities of warehouse and distribution management.*
- *To analyse and quantify warehouse and distribution system performance*
- *To understand the challenges faced in complex warehousing and distribution operations.*
- *To understand the processes in unitization,shipping and packaging of warehouse.*

Introduction To Warehousing, Issues and Processes : Warehouse rationale and material flow - Need for a warehouse - Types of warehouses - Fluid model of the product flow - Storage decisions - Functions, Systems, Storage and handling equipment's - Material flow and warehouse layout : Pallets and cartons, Fast pick area, Slotting-Case Study **(9)**

Managing Warehouse Efficiency : Order picking - Picking by 'Bucket brigade', Pick paths, Cross docking - Measuring warehouse efficiency: Activity profiling and Benchmarking - Warehouse workforce design and development: Safety and Ergonomics-Case Study. **(9)**

Unitization : Container Optimization - Container loading - Dock Management - Labelling and its essentials -Case Study. **(9)**

Shipping and Packaging : Packaging : Design, Materials and kinds, Preparation for packaging - Packing for transportation - Packing procedures, cost, Marking - Packaging of hazardous goods -Case Study. **(9)**

Distribution Facilities Management : Material handling system design -Material Handling Technologies- Modern warehousing: Automatic identification and communication system, AS / RS - Warehousing around the world-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Frazelle, "World Class Warehousing & Material Handling", Tata McGraw-Hill, 2008.*
2. *Satish K. Kapoor and Purva Kansa, "Basics of Distribution Management - A Logistical Approach", Prentice Hall, 2003.*
3. *Satish K. Kapoor and PurvaKansal, "Marketing Logistics - A Supply Chain Approach", Pearson Education, 2003.*
4. *Vinod V Sople, "Logistics Management", Pearson Education, 2004.*
5. *Arnold, "Introduction to Materials Management", Pearson Education, 2009.*

MANAGEMENT STREAM - GENERAL MANAGEMENT

Course Code	Course Name
17MDCE41	Business Environment
17MDCE42	Legal Aspects of Business
17MDCE43	Information Technology for Managers
17MDCE44	Direct and Indirect Tax
17MDCE45	Technology and Innovation Management
17MDCE46	Business Process Management

17MDCE41 - BUSINESS ENVIRONMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Differentiate between the needs and wants of a society and can identify how these are satisfied through business activity.*
- *Distinguish between the primary, secondary and tertiary sectors of the economy.*
- *Evaluate the difference between the public and private sectors of an economy and can identify their differing objectives.*
- *Assess the differing objectives of private and public sector businesses.*
- *Assess the various constituents of business environment and their impact in the globalized scenario.*

Business Environment : Meaning, Types of Environment. Environmental Analysis: Stages, Approaches, Techniques. Nature and Scope of Business: Business System, Classification of business, Characteristics of business, classification of industries. Economic Environment: Nature, Structure, Economic Policies, Economic conditions- Case Study **(9)**

Consumerism and Business : Consumer Rights, Exploitation of Consumers, Consumer Protection, UN Guidelines for Consumer Protection, Consumer Protection and consumerism in India, Consumer Protection Act 1986. Corporate Governance: Meaning, Importance, Reasons for the growing demand for CG- Case Study **(9)**

Industrial Policies & Regulations : Industrial Policy, Industrial Licensing. Competition Law: Competition Act 2002. Patents & Trademarks: Patent Protection in India, The Trade Marks Act 1999. Technological Environment: Innovation, Product and Process innovation, Technology and Competitive advantage- Case Study. **(9)**

Societal Environment : Business Ethics, Business and Culture, Cultural Traits, Technological developments and Social change. Social Responsibility of Business: Meaning, Classical and contemporary views, Social Orientations of Business, Factors affecting Social Orientation. Responsibility to different Sections.Social Audit.- Case Study. **(9)**

Globalisation : GATT/ WTO/The Uruguay Round, WTO & Developing Countries, WTO and India .MNCs: Definition and Meaning, MNCs & International Trade, MNC's in India. Globalisation of World Economy, Globalisation of Business, Stages of Globalisation, Foreign Market Entry Strategies- Case Study. **(9)**

TOTAL : 45

TEXT BOOK

1. *Francis Cherunilam, "Business Environment: Text & Cases", Himalaya Publishing, Mumbai, 18th Edition, 2014.*

REFERENCE BOOKS

1. *Justin Paul, "Business Environment", Tata McGraw Hill, New Delhi, 2nd Edition, 2006.*
2. *SubbaRao P, "International Business: Text & Cases", Himalaya Publishing, Mumbai, 4th Edition, 2014.*
3. *Aswathappa K, "Essentials of Business Environment", Himalaya Publishing, Mumbai, 4th Edition, 2014.*
4. *Philip R. Cateora, "International Marketing", Irwin McGraw Hill, 9th edition.*

17MDCE42 - LEGAL ASPECTS OF BUSINESS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Create knowledge about the legal perspective of the business*
- *Understand the implications of legal laws in improving business practices*
- *Analyse the situation of business environment and make business decisions*
- *Develop the best tax practices for the business in the legal perspectives*
- *Analyse the various Legal business case problems make decisions.*

COMMERCIAL LAW

The Indian Contract Act 1872: Definition of contract, essentials, elements and types of a contract, Formation of a contract, performance of contracts, breach of contract and its remedies, Quasi contracts - Contract of Agency: Nature of agency, Creation and types of agents, Authority and Liability of Agent and principal; Rights and duties of principal and agents, termination of agency. Case Study **(9)**

The Sale of Goods Act 1930: Nature of sales contract, documents of title, risk of loss, Guarantees and Warranties, performance of sales contracts, conditional sales and rights of an unpaid seller - Negotiable Instruments Act 1881: Nature and requisites of negotiable instruments, Types of negotiable instruments, liability of parties, holder in due course, special rules for cheque and drafts, discharge of negotiable instruments-Case Study. **(9)**

COMPANY LAW

Major principles- Nature and types of companies, Formation, Memorandum and Articles of Association, Prospectus, Power, duties and liabilities of directors, winding up of companies, Corporate Governance-Case Study. **(9)**

INDUSTRIAL LAW

An Overview of Factories Act - Payment of Wages Act- Payment of Bonus Act - Industrial Disputes Act-Case Study. **(9)**

Income Tax Act and Sales Tax Act

Corporate Tax Planning, Overview of central sales tax act 1956 - Defiitions, Scope, Incidence of CST and GST, Practical issues of CST and GST, Value Added Tax - Concepts, Scope, Methods of VAT Calculation, Practical Implications of VAT-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *N.D. Kapoor, "Elements of Mercantile Law", Sultan Chand and Company, India, 2006.*
2. *P.K. Goel, "Business Law for Managers", Biztantatara Publishers, India, 2008*
3. *Akhileshwar Pathack, "Legal Aspects of Business", Tata McGraw Hill, 2009*
4. *P.P.S. Gogna, "Mercantile Law", S. Chand & Co Ltd, India, Fourth Edition, 2008.*
5. *Dr. Vinod, K.Singhania, "Direct Taxes Planning and Management", 2008.*
6. *Richard Stim, "Intellectual Property - Copy Rights, Trade Marks and Patents", Cengage Learning, 2008.*

17MDCE43 - INFORMATION TECHNOLOGY FOR MANAGERS

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop an understanding about the use of business analytics*
- *Understand the application of business analytics in industries like banking, insurance, retail and media & communication*
- *Analyse and make decisions using business analytics in the major industrial domains*
- *Gain knowledge with case studies and the impact of business analytics*
- *Evaluate the use of business analytics in the major industrial domains*

Introduction to Business Analytics for Industries and open standards : Understanding briefly - Banking Industry, Insurance Industry, Retail & CPG Industry and Media & Communication (Telecom) Industry: Briefly understanding Business Analytics applications with respect to banking, insurance: retail & CPG and social media and communication industry: Introduction to Industry Vertical Open Standards: Advantages of Open Industry standards: Healthcare, Retail, Insurance verticals-Case Study. **(9)**

Business Analytics for Banking Industry : Banking Industry Overview: IT Landscape / Business Applications: Key Issues/Pain points: Business Analytics solutions & Use case Scenarios for below Business Areas/Organization Units: Marketing, Product Management, Channel Management, Risk Management, Finance Treasury, Payments. Case Studies. **(9)**

Business Analytics for Insurance Industry : Insurance Industry Overview: IT Landscape / Business Applications: Key Issues/ Pain points: Business Analytics solutions & Use case Scenarios in below are as: Finance, Sales and marketing distribution, Risk, Claims: Case Studies. **(9)**

Business Analytics for Retail & Consumer Products : Retail & CPG Industry Overview; IT Landscape / Business Applications; Key Issues/Pain points; Business Analytics solutions & Use case Scenarios; Case Studies - Merchandising, Operations, Marketing, Store Managers, Brand Managers, Distribution, Finance, HR Case Studies. **(9)**

Business Analyticsfor Media & Communication : Media & Communication (Telecom) Industry Overview; IT Landscape/ Business Applications: Key Issues/Pain points: Business Analytics solutions & Use. Case Scenarios: Finance, Marketing, Product development, Customer care Case Studies. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Sesil, J.C., "Applying Advanced Analytics to HR Management Decisions: Methods for Selection, Developing Incentives, and Improving", Pearson FT Press, 2013.*
2. *PavelRyzhov, "Haskell Financial Data Modeling and Predictive Analytics", Packt Publishing, 2013.*
3. *Chuck Hemann& Ken Burbary, "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World (Que Biz-Tech)", 2013.*

17MDCE44 - DIRECT AND INDIRECT TAX

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Apply the critical thinking and problem solving skills related to taxation.*
- *Understand and apply the ethical principles and Professional standards in taking decision related to tax.*
- *Describe how the provisions in the corporate tax laws can be used for tax planning.*
- *Evaluate the practical cases of tax planning as an important managerial decision-making process.*
- *Compare the real life situations involving taxation and make tax-sensitive decisions.*

Tax : Meaning, Characteristics, Objectives, and Canons of Taxation Effects of Taxation, Direct and Indirect Taxes, Merits and Demerits. **(9)**

Direct Tax : Income Tax Act, Principles of Income, Computation of Total Income (Problems), Assess, Assessment year, previous year, Residential Status. **(9)**

Theoretical Concepts related to Salaries - Income from House Property - Capital Gains - Deductions. **(9)**

Indirect Tax: Central Excise Act 1944 - Basic Concepts and Definitions - Customs Act 1962. **(9)**

Service Tax and Value Added Tax (VAT): Service tax - concept, computing methods - Sales tax concept - VAT- Concept, computing methods - GST - Concept, Computing Methods - Filing Procedures of GST. **(9)**

TOTAL : 45

REFERENCE BOOKS

1. *Gaurishankar. V, "Principles of Taxation", Eastern Book Company: New Delhi, 2007*
2. *Gaur and Narang, "Income Tax Law and Practice", Kalyani Publications: New Delhi.*
3. *Balachandran V., "Indirect Taxes", Sultan Chand & Sons: New Delhi.*
4. *P.Radha Krishnan, "Indirect Taxation", Kalyani Publishers: New Delhi.*
5. *Richard A. Musgrave, "The Theory of Public Finance", McGraw Hill Book Company, INC, New York.*
6. *Vinod Singhania, "Income Tax Law and Practice", Taxman's: New Delhi.*
7. *Datey V.S. "Indirect Taxes, Law and Practice", Taxmann Publications: New Delhi*

17MDCE45 - TECHNOLOGY AND INNOVATION MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Develop Conceptual Knowledge and Practical skill regarding technological innovation*
- *Understand how technological innovation diffuse overtime*
- *Analyse the support of the organisation for technology innovation*
- *Integrate external and internal technologies and innovations*
- *Apply the knowledge of Technology and Innovation to real business cases.*

Introduction : The Importance of Technological Innovation - The Impact of Technological Innovation and Society - Innovation by Industry-Case Study. **(9)**

Industry Dynamics of Technological Innovation : Sources of Innovation - Types and Patterns of Innovation - Standards Battles and Design Dominance - Timing of entry-Case Study. **(9)**

Formulating Technological Innovation Strategy : Defining the organisations strategic direction - Choosing innovation projects - Collaboration strategies - Protecting Innovation-Case Study. **(9)**

Implementing Technological Innovation Strategy : Organising for Innovation - Managing the New Product Development Process - Managing New Product Development Teams-Crafting a Deployment strategy-Case Study. **(9)**

Technology Based Entrepreneurship - Knowledge Spill over Entrepreneurship - Innovation in Large and Small Firms-Case Study. **(9)**

Total : 45

REFERENCE BOOKS

1. *Melissa Schilling, "Strategic Management of Technological Innovation", Mc.Graw Hill Publications, New York, Fourth Edition, 2012.*
2. *Scott Shane, "Handbook of Technology and Innovation Management", Wiley Publications.*
3. *Chesbrugh, "Open Innovations", Harvard Business School Press, USA, First Edition, 2003.*
4. *Osterwalder and Pigneur, "Business Model Generation", Wiley Hoboken, NI, USA, First Edition, 2010.*

17MDCE46 - BUSINESS PROCESS MANAGEMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION TO BUSINESS PROCESS MANAGEMENT (BPM)

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

PROCESS IDENTIFICATION AND MODELING

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

ADVANCED PROCESS MODELING

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

PROCESS DISCOVERY

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

PROCESS ANALYSIS AND REDESIGN

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

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOK

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

COMPUTER SCIENCE STREAM - DATA ANALYTICS

Course Code	Course Name
15MSSE34	Machine Learning
16MDS53	Big Data Architecture
16MDSE2	Web Mining
16MDS83	Data Visualization
16MDSE6	Information Security Analytics
16MDSE20	Data Centric Computing
16MDSE8	Bio Informatics
16MDSE3	Social Network Analysis
16MDSE4	Geographical Information Analysis
16MDSE11	Econometric Analysis
16MDS92	Deep Learning

15MSSE34 - MACHINE LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

DECISION TREE LEARNING

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

ANN

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

BAYESIAN LEARNING

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

ANALYTICAL AND COMBINING ANALYTICAL & INDUCTIVE LEARNING

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

INSTANCE-BASED AND REINFORCEMENT LEARNING

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

TOTAL : 45

REFERENCE BOOKS

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

16MDS53 - BIG DATA ARCHITECTURE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34

ASSESSMENT : THEORY

COURSE OUTCOME

- *Architectural issues present when building big data systems.*
- *Analyze the analytical techniques on variety of Big data application scenarios.*
- *Apply hadoop clusters and map reduce programs for parallel processing of big data.*
- *Compare :Compare PIG and HIVE with traditional databases.*
- *Generate: Generate dynamic solutions for data analytics problems using map reduce framework.*

INTRODUCTION

Big data characteristics - Volume, Veracity, Velocity, Variety Value - Issues - Case for Big data - Big data options. Team challenge - Big data sources - Acquisition - Features of Big Data - Security, Compliance, auditing and protection.

Understanding the Big Data Project's Ecosystem - Creating the Foundation of a Long-Term Big Data Architecture -Early Big Data with NoSQL - NoSQL Landscape - Introducing Couchbase - Introducing ElasticSearch - Using NoSQL as a Cache in a SQL-based Architecture. **(9)**

STREAMING DATA

Streaming Data - Streaming Architecture - The Anatomy of the Ingested Data - Setting Up the Streaming Architecture

QUERYING AND ANALYZING PATTERNS

Definining an Analytics Strategy - Process and Index Data Using Spark **(9)**

THE HADOOP ECOSYSTEM

Big Data and the HadoopEcosystem- 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)**

PROCESSING DATA WITH MAPREDUCE

Getting to Know First MapReduce Application - Designing MapReduce Implementations

CUSTOMIZING MAPREDUCE EXECUTION

Reading Data Way with Custom Record Readers -Organizing Output Data with Custom Output Formats - Writing Data Your Way with Custom Record Writers - Optimizing MapReduce Execution with a Combiner - Controlling Reducer Execution with Partitioners - Using Non-Java Code with Hadoop **(9)**

PIG

Installing and Running Pig - Comparison with Databases - Pig Latin -User-Defined Functions - Data Processing Operators -Pig in Practice

Hive

Installing Hive - Running Hive -Comparison with Traditional Databases -HiveQL -Tables - Querying Data -User-Defined Functions **(9)**

TOTAL : 45

TEXT BOOKS

1 . *Bahaaldine Azarmi. "Scalable Big DataArchitecture -A Practitioner's Guide to ChoosingRelevant Big Data Architecture" A Press, 2016, (Para 1, Para 2, Para 3)*

2. *Kevin T. Smith, Alexey Yakubovich, Boris Lublinsky, "Professional Hadoop® Solutions", John Wiley & Sons Inc, 2013. (Para 4, Para 5, Para 6)*

3. *Tom White - Beijing, "Hadoop: The Definitive Guide", O'reilly, Third Edition, Jan 2012. (Para 7, Para 8)*

16MDSE2 - WEB MINING

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC64

ASSESSMENT : THEORY

COURSE OUTCOME

- *To outline on a detailed overview of the data mining process and techniques, specifically those that are relevant to Web mining.*
- *Identify and differentiate between application areas for web content mining, web structure mining and web usage mining.*
- *To demonstrate the basics of Information retrieval and Web search with special emphasis on web Crawling.*
- *To apply the use of machine learning approaches for Web Content Mining, the role of hyper links in web structure mining and the various aspects of web usage mining.*
- *Develop skills of using recent data mining software for solving practical problems of Web Mining.*

INTRODUCTION

Introduction - Web Mining - Theoretical background -Algorithms and techniques - Association rule mining - Sequential Pattern Mining -Information retrieval and Web search - Information retrieval Models-Relevance Feedback- Text and Web page Pre-processing - Inverted Index - Latent Semantic Indexing - Web Search - Meta-Search - Web Spamming **(9)**

WEB CONTENT MINING

Web Content Mining - Supervised Learning - Decision tree - Naïve Bayesian Text Classification - Support Vector Machines - Ensemble of Classifiers. Unsupervised Learning - K-means Clustering - Hierarchical Clustering -Partially Supervised Learning - Markov Models - Probability-Based Clustering - Evaluating Classification and Clustering - Vector Space Model - Latent semantic Indexing - Automatic Topic Extraction - Opinion Mining and Sentiment Analysis - Document Sentiment Classification. **(9)**

WEB LINK MINING

Web Link Mining - Hyperlink based Ranking - Introduction -Social Networks Analysis- Co-Citation and Bibliographic Coupling - Page Rank -Authorities and Hubs -Link-Based Similarity Search - Enhanced Techniques for Page Ranking - Community Discovery - Web Crawling - A Basic Crawler Algorithm- Implementation Issues- Universal Crawlers- Focused Crawlers - Topical Crawlers Evaluation - Crawler Ethics and Conflicts - New Developments **(9)**

STRUCTURED DATA EXTRACTION

Structured Data Extraction: Wrapper Generation - Preliminaries- Wrapper Induction- Instance-Based Wrapper Learning ·- Automatic Wrapper Generation: Problems - String Matching and Tree Matching -. Multiple Alignment - Building DOM Trees - Extraction Based on a Single List Page and Multiple pages- Introduction to Schema Matching - Schema-Level Match -Domain and Instance-Level Matching - Extracting and Analyzing Web Social Networks. **(9)**

WEB USAGE MINING

Web Usage Mining - Click stream Analysis -Web Server Log Files - Data Collection and PreProcessing - Cleaning and Filtering- Data Modeling for Web Usage Mining - The BIRCH Clustering Algorithm -Affinity Analysis and the A Priori Algorithm - Binning. Discovery and Analysis of Web Usage Patterns - Modeling user interests -Probabilistic Latent Semantic Analysis - Latent Dirichlet Allocation Model- Applications- Collaborative Filtering- Recommender Systems - Web Recommender systems based on User and Item - PLSA and LDA Models **(9)**

TOTAL : 45

TEXT BOOKS

1. *Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer; 2nd Edition 2009. (Para 1, Para 2, Para 3, Para 4, Para 5)*
2. *Guandong Xu ,Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer; 1st Edition, 2010. (Para 1, Para 2, Para 4)*
3. *Zdravko Markov, Daniel T. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley & Sons, Inc., 2007. (Para 5, Para 2)*

REFERENCE BOOKS

1. *Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.*
2. *Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc, 2005.*
3. *Min Song, Yi Fang and Brook Wu, Handbook of research on Text and Web mining technologies, IGI global, information Science Reference - imprint of : IGI publishing, 2008.*

16MDS83 - DATA VISUALIZATION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Understand different data visualization techniques.*
- *Gain practical experience in building and evaluating visualization systems.*
- *Determine the methods of presentation to an audience once an insight has been found.*

INTRODUCTION TO DATA VISUALIZATION

Seven stages of visualizing data-getting started with processing-mapping-Time Series- Connections and Correlations-scatterplot maps-trees, hierarchies & recursions-Networks and graphs-Acquiring data-Parsing data **(15)**

DATA REPRESENTATION

Computer graphics and visualization-Discrete data representation in visualization applications-Visualization pipeline. **(10)**

TECHNIQUES FOR DATA VISUALIZATION

Fundamental techniques for scalar visualization-Vector visualization techniques- Tensor visualization techniques- Information visualization techniques. **(10)**

INTRODUCTION TO D3

Technology Fundamentals: Embedding with HTML, DOM, CSS, Javascript, SVG-Drawing with data-Scales **(10)**

TOTAL : 45

TEXT BOOKS

1. *Ben Fry, O'Reilly, "Visualizing data: Exploring and Explaining data with the processing environment", 2007. (Para I)*
2. *Alexandru C Telea, "Data Visualization Principles and Practice, CRC Press", 2nd edition, 2014. (Para II, III)*
3. *Scott Murray, O'Reilly," Interactive data visualization for the web", 2013 (Para IV)*

16MDSE6 - INFORMATION SECURITY ANALYTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To give insights into the practice of analytics.*
- *To utilize analytic techniques to identify trends.*
- *To provide a wealth of analytics experience to demonstrate practical, hands-on techniques through case studies.*

INTRODUCTION

ANALYTICS DEFINED AND ANALYTICAL SOFTWARE TOOLS

Introduction to Security Analytics - Concepts and Techniques in Analytics - Data for Security Analytics - Analytics in Everyday life - Security Analytics Process. Introduction - Statistical Programming- Introduction to Databases and Big Data Techniques- Introduction to R- Introduction to Python-Introduction to Simulation. **(10)**

ANALYTICS AND INCIDENT RESPONSE

Introduction - Scenarios and Challenges in intrusions and incident identification- Analysis of Log files- Loading the Data-Another Potential Analytical Data Set: Unstacked Status Codes- Other Applicable Security Areas and Scenarios. **(9)**

SIMULATIONS AND SECURITY PROCESSES

Simulation - Designing and Creating a Model- Adding Data and Parameters to the Model - Running and Analyzing the Simulation. **(7)**

ACCESS ANALYTICS

Introduction -Technology Primer- Scenario, Analysis and Techniques - Case Study- Analyzing the Results. **(7)**

TEXT MINING AND SECURITY INTELLIGENCE

Scenarios and challenges in security Analytics with Text Mining - Use of Text mining Techniques to analyze and find patterns in unstructured Data - Step by Step Text Mining Example in R- other Applicable Security Areas and Scenarios. Security Intelligence Overview - Security Breaches - Practical Applications. **(12)**

TOTAL : 45

TEXT BOOK

1. *Mark Talabis, Robert McPherson, I Miyamoto, Jason Martin," Information Security Analytics: Finding Security Insights, Patterns and Anomalies in Big Data", SyngressMedia,U.S. 2014.*

REFERENCE BOOK

1. *Jay Jacobs, Bob Rudis," Data-Driven Security: Analysis, Visualization and Dashboards", Wiley ,2014.*

16MDSE20 - DATA CENTRIC COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC34, 17MDC63

ASSESSMENT : THEORY

COURSE OUTCOME

- *To understand the importance of Data-Intensive Computing and the need for Parallel Computing.*
- *To provide knowledge on Data-Intensive architecture and techniques.*
- *To learn security in Data-Intensive Computing.*

DATA-INTENSIVE COMPUTING - INTRODUCTION

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

DATA-INTENSIVE COMPUTING ARCHITECTURE

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

DATA-INTENSIVE SOFTWARE SYSTEMS

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

TECHNOLOGIES AND TECHNIQUES

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

SECURITY IN DATA-INTENSIVE COMPUTING

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

TOTAL : 45

TEXT BOOKS

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

REFERENCE BOOK

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

16MDSE8 - BIO-INFORMATICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *To introduce a new scientific discipline Bioinformatics, the combined power of biology, mathematics and computers.*
- *To impart knowledge in computer science with biology to unite raw data with powerful software tools and mathematical models.*
- *It represents a frontier in biological research and the best path toward finding meaning in a world of complex data.*

INTRODUCTION

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

CODING

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

PATIENT RECORD MAINTENANCE

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

PROTEIN INFORMATION RESOURCES

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

ALIGNMENT TECHNIQUES

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

PROBLEM SOLVING IN BIOINFORMATICS

Gnome analysis for DNA sequences, protein sequences, Strategies and options for similarity search, Practical considerations in sequence analysis, Flow chart for protein structure prediction -Illustrations **(7)**

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOKS

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

16MDSE3 - SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC64, 16MDS83

ASSESSMENT : THEORY

COURSE OUTCOME

- *Work on the internal components of the social network.*
- *Model and visualize the social network.*
- *Mine the behaviour of the users in the social network.*
- *Predict the possible next outcome of the social network.*
- *Preserving privacy in social networks and real time social network application.*

INTRODUCTION

Introduction to Web - Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks **(9)**

MODELING AND VISUALIZATION

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality- Clustering - Node-Edge Diagrams - Visualizing Social Networks with Matrix Based Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data - Random Walks and their Applications -Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships. **(9)**

MINING COMMUNITIES

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities - Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks. **(9)**

EVOLUTION

Evolution in Social Networks - Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation - Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models. **(9)**

PRIVACY IN SOCIAL NETWORKS AND APPLICATIONS

Introduction - Privacy breaches in Social Networks - Privacy definitions for publishing data - privacy preserving mechanisms. APPLICATION : A learning based approach for Real Time Emotion Classification of Tweets - Assessing the opinion of users in Social Network enviroments. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.*
2. *Borko Furht, "Handbook of Social Network Technologies and Applications, Springer", 1st edition, 2011.*
3. *Charu C. Aggarwal, "Social Network Data Analytic", Springer; 2014.*

REFERENCE BOOKS

1. *Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2012*
2. *Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.*
3. *Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking - Techniques and applications", Springer, 1st edition, 2012*
4. *Przemyslaw Kazienko, Nitesh Chawla,"Applications of Social Media and Social Network Analysis", Springer, 2015 CP5007 BIO-INSPIRED CO.*

16MDSE4 - GEOGRAPHICAL INFORMATION ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

The student will be able to

- *Describe the issues in spatial data analysis and categorize the spatial data using data fields.*
- *Apply the suitable spatial data analytical technical methods to geographical application.*
- *Generate the procedure to analyze the spatial data based on the spatial objects and field objects.*

INTRODUCTION

Geographic Information Analysis and Spatial Data : Spatial Data Types - Scales for Attribute Description - GIS and Spatial Data Manipulation. The Pitfalls and Potential of Spatial Data: The Pitfalls of Spatial Data - The Potential of Spatial Data. **(6)**

MAPPING AND MAP PROCESS

Mapping It Out : The Cartographic Tradition - Geovisualization and Analysis - The Graphic Variables of Jacques Bertin - New Graphic Variables - Issues in Geovisualization - Mapping and Exploring Points - Mapping and Exploring Areas - Mapping and Exploring Fields - The Spatialization of Nonspatial Data. Maps as Outcomes of Processes: Introduction: Maps and Processes - Processes and the Patterns They Make - Predicting the Pattern Generated by a Process - Stochastic Processes in Lines, Areas, and Fields. **(10)**

POINT PATTERN ANALYSIS

Basics - Describing a Point Pattern - Assessing Point Patterns Statistically - Monte Carlo Testing. Practical Point Pattern Analysis: Problems of Spatial Statistical Analysis - Alternatives to Classical Statistical Inference - Alternatives to IRP/CSR 162 - Point Pattern Analysis in the Real World - Dealing with homogeneity - Focused Approaches - Cluster Detection: Scan Statistics - Using Density and Distance: Proximity Polygons - A Note on Distance Matrices and Point Pattern Analysis. **(10)**

AREA OBJECTS, LOCAL STATISTICS

Types of Area Objects - Geometric Properties of Areas - Measuring Spatial Autocorrelation - An Example: Tuberculosis in Auckland 2001-2006 - Other Approaches. Local Statistics: Think Geographically, Measure Locally Introduction - Defining the Local: Spatial Structure - An Example: The Getis-Ord Gi and Gi * Statistics - Inference with Local Statistics - Other Local Statistics. **(9)**

ANALYZING FIELDS AND STATISTICS OF FIELDS

Describing and Analyzing Fields : Scalar and Vector Fields Basics - Modeling and Storing Field Data - Spatial Interpolation - Derived Measures on Surfaces - Map Algebra. Knowing the Unknowable : The Statistics of Fields: Regression on Spatial Coordinates: Trend - Surface Analysis - The Square Root Differences Cloud and the (Semi-) Variogram - A Statistical Approach to Interpolation: Kriging. Map Overlay: Boolean Map Overlay and Sieve Mapping - A General Model for Alternatives to Boolean Overlay - Indexed Overlay and Weighted Linear Combination - Weights of Evidence - Model-Driven Overlay Using Regression. **(10)**

TOTAL : 45

TEXT BOOK

1. *David O'Sullivan and David J. Unwin, "Geographic Information Analysis", John Wiley Inc., Second Edition, 2010.*

16MDSE11 - ECONOMETRIC ANALYSIS

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC13, 17MDC21, 17MDC31, 17MDC41

ASSESSMENT : THEORY

COURSE OUTCOME

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

- *Understand the analysis of economic data using Simple and Multiple Regression Models.*
- *Analyse the properties of Ordinary Least Square (OLS) Estimators, assumptions underlying Multiple Linear Regression Equation and understand the properties of sampling distribution of OLS Estimators.*
- *Get a good knowledge in using Dummy Variables in Regression Analysis.*
- *Analyse time series data using Regression models.*

REVIEW OF MATHEMATICS AND STATISTICS

The Nature of Econometrics and Economic Data-What is Econometrics? - Steps in Empirical Economic Analysis-The structure of Economic Data- Causality and the Notion of Ceteris Paribus in Econometric Analysis-Regression Analysis with Cross-Sectional Data - The Simple Regression Model-Properties of OLS on any sample of data- Units of measurement and functional form-Expected values and Variances of OLS Estimators-Assumptions of Simple Regression - Regression through the origin and Regression on a constant. **(9)**

MULTIPLE LINEAR REGRESSION (MLR) - OLS ESTIMATES

Analysis Estimation- Motivation for Multiple Regression: The Model with two independent variables- The Model with k independent variables- Obtaining OLS Estimates-Mechanics and Interpretation of the OLS Regression Equation-Meaning of holding other factors fixed in Multiple Regression-Changing more than one independent variable simultaneously-OLS fitted values and residuals-Goodness of fit-Regression through origin-The expected values of OLS Estimators-Assumptions of MLR-Including irrelevant variables in MLR-Omitted Variable bias-Variance of the OLS -The components of the OLS Variance: Multicollinearity-Estimating :Standard errors of OLS Estimators- -Efficiency of OLS-Gauss Markov Theorem. **(9)**

MLR INFERENCE

Multiple Regression Analysis Inference-Sampling distribution of OLS estimators-Testing Hypotheses about a single population parameter-The t-test-Confidence Intervals- Testing hypotheses about a single linear combination - Testing Multiple Linear Restrictions: The F test-Reporting regression results Multiple Regression Analysis - Further Issues: Effects of data scaling on OLS Statistics-More on functional form- More on goodness of fit and selection of regressors-Prediction and residual analysis **(9)**

MLR INCLUSION OF DUMMY VARIABLES

Multiple Regression Analysis with qualitative information Dummy variables-Describing qualitative information - A single dummy independent variable-Using Dummy variables for multiple categories-Interactions involving dummy variables-A binary dependent variable-The linear probability model-Interpreting Regression results with discrete dependent variables. **(9)**

ANALYSIS OF TIME SERIES DATA

Regression Analysis with Time Series Data Nature of Time Series Data-Examples of Time Series Regression Models-Static models-Finite distributed lag models. **(9)**

TOTAL : 45

TEXT BOOK

1. *Wooldridge J.M." Introductory Econometric", A Modern Approach, Fifth Edition, South-Western(2009)*

REFERENCE BOOKS

1. *Gujarati, "Basic Econometrics", Fourth Edition, The McGraw Hill Companies, 2004.*
2. *William H.Greene, "Econometric Analysis ", Fifth Edition, Prentice Hall ,2002.*
3. *Koutsoyiannis, A. "Theory of Econometrics", Second Edition,Palgrave Macmillian ,2001.*

16MDS92 - DEEP LEARNING

L	T	P	C
3	0	0	3

PRE-REQUISITES

15MSSE34

ASSESSMENT : THEORY

COURSE OUTCOME

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

- *Understand basics of deep learning.*
- *Explain how traditional feed-forward networks are constructed and why they can approximate almost any function.*
- *Summarise the key components in convolutional neural networks (CNNs) and their key advantages.*
- *Describe common types of recurrent neural networks (RNN) and their applications.*
- *Apply popular Deep learning models to their research problems.*

INTRODUCTION

Deep Learning: Overview of Methods, Learning, Numerical, Machine Learning Basics.

Deep Feed-forward Networks: Gradient-Based Learning, Hidden Units, Architecture Design, Back Propagation and other Differentiation Algorithms **(6)**

REGULARIZATION

Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. **(9)**

OPTIMIZATION FOR TRAINING DEEP MODELS

Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Method, Optimization Strategies and Meta-Algorithms. **(9)**

CONVOLUTIONAL NETWORKS

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning. **(9)**

SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, Explicit Memory

APPLICATIONS

Speech Recognition, Natural Language Processing **(12)**

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOKS

1. *Deng & Yu," Deep Learning: Methods and Applications", Now Publishers, 2013.*
2. *Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.*

COMPUTER SCIENCE STREAM - DISTRIBUTED AND NETWORK SYSTEMS

Course Code	Course Name
15MSSE19	Soa and Web Services
15MSSE35	Blockchain Technology
15MSSE17	Internetworking Protocols
17MDCE51	Distributed Systems

15MSSE19 - SOA AND WEB SERVICES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION TO SOA

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

WEB SERVICES AND SOA

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

SOA AND SERVICE-ORIENTATION

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

BUILDING SOA

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

WEB SERVICES IN JAVA

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

TOTAL : 45

TEXT BOOKS

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

15MSSE35 - BLOCKCHAIN TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Describe the basics of distributed environment and decentralization.*
- *Describe the fundamentals of Blockchain.*
- *Analyze the working principles of Bitcoin, Develop Cryptography algorithms to protect Cryptocurrencies.*
- *Analyze the concepts of smart contracts and ethereum.*
- *Examine the development platform ethereum and Hyperledger.*

BLOCKCHAIN

Introduction - Distributed Systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain. Decentralization - Decentralization using blockchain, methods of decentralization, routes to decentralization, blockchain and full ecosystem decentralization, smart contract, decentralized autonomous organization, corporations, societies, application, Platforms for decentralization. **(10)**

CRYPTOCURRENCIES

Cryptographic primitives - Hash Functions, Bitcoin, transactions, blockchain, bitcoin payments, Alternative coins - theoretical foundations, bitcoin limitations. **(10)**

SMART CONTRACTS AND ETHEREUM

Smart Contracts, Ethereum - Introduction, ethereum blockchain, elements, precompiled contracts, accounts, block, ether, messages, mining, clients and wallets, trading and investment, symbols, ethereum network, applications, scalability and security. **(9)**

CONTRACT DEVELOPMENT AND DEPLOYMENT

Ethereum development - Setting up a development environment, development tools and clients, Solidity, Web3. **(9)**

HYPERLEDGER

Hyperledger - Fabric, Sawtooth lake, CORDA **(7)**

TOTAL: 45

TEXT BOOK

1. *Imran Bashir, "Mastering Blockchain", Packt Publishing, First Edition, 2017.*

REFERENCE BOOKS

1. *Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies", Princeton University Press, 2016.*
2. *Roger Wattenhofer, "The Science of the Blockchain", Inverted Forest Publishing, First Edition, 2016.*
3. *Don and Alex Tapscott, "Blockchain Revolution". Portfolio Penguin 2016.*
4. *Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly, Second Edition, 2017.*

15MSSE17 - INTERNETWORKING PROTOCOLS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

LINK LAYER

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

INTERNET LAYER

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

TRANSPORT LAYER

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

APPLICATION LAYER

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

TOTAL : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

17MDCE51 - DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Elucidate the foundations and issues of distributed systems*
- *Understand the various synchronization issues and global state for distributed systems.*
- *Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems*
- *Describe the agreement protocols and fault tolerance mechanisms in distributed systems.*
- *Describe the Architecture of a Distributed System*

INTRODUCTION

Definition, Goals, Types of Distributed Systems **(4)**

ARCHITECTURES

Architectural Styles, System Architectures - Centralized Architectures, Decentralized Architectures, Hybrid Architectures, Architectures Versus Middleware **(6)**

PROCESS AND COMMUNICATION

Threads, Virtualization, Clients, Servers, Layered Protocols, Types of Communication, Remote Procedure call, Message Oriented Communication, Stream Oriented Communication, Multicast communication. **(10)**

SYNCHRONIZATION : CLOCK SYNCHRONIZATION, LOGICAL CLOCKS, MUTUAL EXCLUSION

Distributed Transactions: Consistency and Replication - Introduction ,Data Centric Consistency Models, Client Centric Consistency Models, Replica Management, consistency Protocols **(8)**

Distributed Computing Paradigm - Paradigm for distributed Applications - Basic Algorithms in Message Passing Systems, Leader Election in Rings, Mutual Exclusion in shared Memory, Fault-Tolerant Systems - Synchronous systems with Crash failures, Synchronous systems with Byzantine failures, Impossibility in Asynchronous Systems **(12)**

EXAMPLES OF DISTRIBUTED SYSTEMS

CORBA, Jini. **(5)**

TOTAL : 45

TEXT BOOKS

1. *Distributed Systems - Principles and Paradigms, Andrew S. Tanenbaum, Maarten van Steen, Prentice Hall of India, 2007 (Para I to Para IV)*
2. *HaggitAttiya and Jennifer welch - Distributed Computing - Fundamentals, Simulation and Advanced Topics, Second Edition, Wiley 2012 (Para V)*
3. *Distributed Object Architectures with CORBA , Henry Balen, Mark Elenko, Jan Jones and Gordon Palumbo, 1st Edition, Kindle Edition*

REFERENCE BOOKS

1. *Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004*
2. *Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.*
3. *Kshemkalyani, Ajay D., and MukeshSinghal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.*
4. *George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.*

COMPUTER SCIENCE STREAM - SOFTWARE SYSTEMS

Course Code	Course Name
15MSSE09	Graphics and Multimedia Technologies
15MSS63	Software Testing and Quality Assurance
16MDSE7	Image Processing
15MSSE06	Software Requirements Engineering
15MSSE07	Software Reliability
15MSSE08	Open Source Software Development
16MDSE25	Software Architecture and Design Patterns
15MSSE24	Real Time Systems
15MSSE25	Analysis and Design of Real Time Systems
15MSSE27	Computer Vision
15MSSE14	Design Thinking
15MSSE36	Advanced Web Technology

15MSSE09 - GRAPHICS AND MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

TRANSFORMATIONS AND VIEWING

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

COMPUTER ANIMATIONS

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

INTRODUCTION TO MULTIMEDIA

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

FILE FORMATS AND MULTIMEDIA I/O

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

TOTAL : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

15MSS63 - SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

TESTING STRATEGIES

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

LEVELS OF TESTING

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

SYSTEM TEST AND TESTING ARTIFACTS

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

SOFTWARE QUALITY

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

TOTAL : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

16MDSE7 - IMAGE PROCESSING

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

- *Students can apply the image fundamentals and mathematical transforms necessary for image processing.*
- *Students can apply the image enhancement techniques.*
- *Students can apply image restoration procedures.*
- *Students can apply the image compression procedures.*
- *Students can apply the image segmentation and representation techniques.*

FUNDAMENTALS OF IMAGE PROCESSING

Introduction - Elements of visual perception, Steps in Image Processing Systems - Image Acquisition - Sampling and Quantization - Pixel Relationships - Colour Fundamentals and Models, File Formats- Introduction to the Mathematical tools. **(9)**

IMAGE ENHANCEMENT AND RESTORATION

Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering - Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain - DFT, FFT, DCT, Smoothing and Sharpening filters - Homomorphic Filtering., Noise models, Constrained and Unconstrained restoration models. **(9)**

IMAGE SEGMENTATION AND FEATURE ANALYSIS

Detection of Discontinuities - Edge Operators - Edge Linking and Boundary Detection - Thresholding - Region Based Segmentation - Motion Segmentation, Feature Analysis and Extraction. **(9)**

MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

Multi Resolution Analysis: Image Pyramids - Multi resolution expansion - Wavelet Transforms, Fast Wavelet transforms, Wavelet Packets. Image Compression: Fundamentals - Models - Elements of Information Theory - Error Free Compression - Lossy Compression - Compression Standards - JPEG/MPEG. **(9)**

APPLICATIONS OF IMAGE PROCESSING

Representation and Description, Image Recognition- Image Understanding - Image Classification - Video Motion Analysis - Image Fusion - Steganography - Colour Image Processing. **(9)**

TOTAL : 45

TEXT BOOKS

1. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Pearson Education, Third Edition, 2008.*
2. *Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Brooks Cole, Third Edition, 2008.*

REFERENCE BOOKS

1. *Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice-Hall India, 2007.*
2. *Madhuri A. Joshi, 'Digital Image Processing: An Algorithmic Approach", Prentice Hall India, 2006.*
3. *Rafael C.Gonzalez , Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", Pearson Education, First Edition, 2004.*

15MSSE06 - SOFTWARE REQUIREMENTS ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

REQUIREMENTS MODELING

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

QUALITY ATTRIBUTE REQUIREMENTS

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

RE FOR PLATFORMS AND REQUIREMENTS MANAGEMENT

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

REQUIREMENT DRIVEN SYSTEM TESTING AND REQUIREMENTS EVOLUTION

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

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

TOTAL : 45

TEXT BOOK

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

15MSSE07 - SOFTWARE RELIABILITY

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

SOFTWARE RELIABILITY MODELS

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

PREDICTION ANALYSIS

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

THE OPERATIONAL PROFILE

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

TESTING FOR RELIABILITY MEASUREMENT

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

TOTAL : 45

TEXT BOOKS

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

15MSSE08 - OPEN SOURCE SOFTWARE DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

OPEN SOURCE SOFTWARE PROCESS

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

OSS STAKEHOLDERS AND ENVIRONMENT

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

WORLD VIEW

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

OPEN SOURCE LICENSING

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

TOTAL : 45

TEXT BOOKS

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

REFERENCE BOOKS

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

16MDSE25 - SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

- *On Completion of the course, the students should be able to*
- *Describe the various types of software patterns and their needs in software development.*
- *Apply design patterns to solve the issues in designing the objects.*
- *Design the software architectures using appropriate architectural patterns based on the quality attributes and documenting them.*

INTRODUCTION TO PATTERNS

Definition - Making a pattern - Pattern categories - Relationship between patterns - Patterns and software architecture. **(8)**

DESIGN PATTERNS

Introduction - Creational patterns - Structural patterns - Behavioral patterns - Case study. **(10)**

INTRODUCTION TO SOFTWARE ARCHITECTURE

Software architecture definition and needs. Introduction: Architectural patterns - Reference models - Reference architecture - Architectural structures and views. **(8)**

ARCHITECTURAL STYLES

Pipes and filters - Data abstraction and object oriented organization - Event based, Implicit invocation - Layered style - Repository - Interpreter - Process control - Distributed - Case study. **(9)**

THE ARCHITECTURAL BUSINESS CYCLE

Creating an architecture: Understanding quality attributes - Achieving qualities - Designing the architecture - Documenting the architecture - Case study. **(10)**

TOTAL : 45

TEXT BOOKS

1. *Frank Buschmann, Regine Meunier, Hans Rohnex, Peter Sommerland & Michael, "Pattern - Oriented Software Architecture - A Systems of Patterns Volume - I", 1996 (Reprint 2001) (Para - I).*
2. *Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns - Elements of reusable Object Oriented Software", Pearson Education, 1999. (Para II).*
3. *Mary Shaw, David Garlan, "Software Architecture - Perspectives on an Emerging Discipline", PHI,1996 (Para IV).*
4. *Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", 2nd Edition, Pearson Education, First Indian Reprint, 2003. (Para III & V).*

15MSSE24 - REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION

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

RESOURCE SHARING AND SCHEDULING

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

REAL-TIME OPERATING SYSTEMS

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

REAL-TIME COMMUNICATIONS

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

REAL-TIME DATABASES

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

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOKS

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

15MSSE25 - ANALYSIS AND DESIGN OF REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

REQUIREMENTS

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

DESIGN

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

ANALYSIS

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

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

CASE STUDY

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

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOK

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

15MSSE27 - COMPUTER VISION

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOME

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

INTRODUCTION, IMAGE FORMATION AND FILTERING

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

FEATURE DETECTION AND SEGMENTATION

Feature Detection: Points and patches, Edges, Lines.

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

3D RECONSTRUCTION

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

MOTION ESTIMATION

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

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

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

RECOGNITION

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

TOTAL : 45

TEXT BOOK

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

REFERENCE BOOKS

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

15MSSE14 - DESIGN THINKING

L	T	P	C
3	0	0	3

PRE-REQUISITES
17MDC53

ASSESSMENT : THEORY

COURSE OUTCOME

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

OVERVIEW OF DESIGN PROCESS

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

IDEA GENERATION

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

REFINEMENT

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

PROTOTYPING AND IMPLEMENTATION

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

TOTAL : 45

TEXT BOOK

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

15MSSE36 - ADVANCED WEB TECHNOLOGY

L	T	P	C
3	0	0	3

PRE-REQUISITES

17MDC23, 17MDC26

ASSESSMENT : THEORY

COURSE OUTCOME

- *Create responsive user interface using HTML5, CSS3, BOOTSTRAP.*
- *Design richly interactive web pages using AJAX, JSON, jQuery.*
- *Design and develop web applications using the front-end javascript framework AngularJS based on MVC design pattern.*
- *Understand Django fundamentals and use its concepts to build and deploy robust web applications.*
- *Understand the different types of security attacks in web applications.*

USER INTERFACE DESIGN

Markup Language (HTML5): HTML5 Form Input Types, HTML Graphics: Canvas, SVG, HTML Media: Video, Audio, HTML API: Drag/Drop, Geolocation, Web Storage, Web Workers, SSE.

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. **(8)**

ADVANCED JAVASCRIPT

Introduction to JSON, JSON Structure, Introduction to jQuery, 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. **(8)**

ANGULARJS

Introduction to AngularJS, MVC, Filters and Modules, Directives, Working with Forms, Services and Server Communication. **(11)**

DJANGO FRAMEWORK

Introduction, Django for the Impatient: Building a Blog, Starting Out - Dynamic Web Site Basics, layers - Models, Views, Templates, Django Architecture, Django in depth: URLs, HTTP Mechanisms, and Views, Templates and Form Processing. **(11)**

WEB APPLICATION SECURITY

Authentication: Authentication fundamentals, Web Application Authentication, Authorization: Authorization, Authorization Layers, Attacks against authorization, Session management- Attacks against sessions, Browser Security Principles- cross-site scripting and request forgery. **(7)**

TOTAL : 45

TEXT BOOKS

1. *Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", 5th edition, Pearson Education, 2011.*
2. *Andrew Grant, "Beginning AngularJS", Apress, 2014.*
3. *Jeff Forcier, Paul Bissex, Wesley Chun, "Python Web Development with Django", Addison Wesley, 2011.*
4. *Bryan Sullivan, Vincent Liu, "Web Application Security", McGraw Hill, 2012.*

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/*

REFERENCE BOOKS

1. *Brad Dayley, Brendan Dayley, "AngularJS, JavaScript, and jQuery", Pearson Education, 2016.*
2. *Jorge Krause, "Introducing BOOTSRAP 4", Apress, 2016.*
3. *Ben Smith, "Beginning JSON", Apress, 2015.*
4. *David Flanagan, "JavaScript: The Definitive Guide, Sixth Edition", O'Reilly Media, 2011.*
5. *Brad Dayley, Brendan Dayley, "AngularJS, Javascript, and jQuery", Pearson Education, 2016.*
6. *Ken Williamson, "Learning AngularJS", O'Reilly Media, 2015.*
7. *Ayman Hourieh, "Learning Website Development with Django", Packt Publishing, 2008.*
8. *Sanjeev Jaiswal, Ratan Kumar, "Learning Django Web Development", PACKT publishing, 2015.*

ELECTIVE LABORATORY COURSES

Course Code	Course Name
17MDCEL1	Minor Project in Business / Data Analytics
17MDCEL2	Modeling and Simulation Laboratory
15MSSL08	Image Processing Laboratory
15MSSL03	Graphics and Multimedia Laboratory
15MSSL13	Advanced Web Technology Laboratory
16MDS55	Machine Learning Laboratory
16MDS56	Big Data Modeling Laboratory
16MDS85	Data Visualization Laboratory
16MDS94	Deep Learning Laboratory
15MSS65	Software Testing Laboratory
16MDSEL2	Web Mining Laboratory

17MDCEL1- MINOR PROJECT IN BUSINESS / DATA ANALYTICS

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Identify a business problem existing in an organization that needs to be addressed.*
- *Analyse the business environment with respect to the identified problem.*
- *Design an appropriate solution considering economic, technical and implementation feasibility.*
- *Justify the designed solution in terms of its pros and cons.*

ACTIVITIES TO BE CARRIED OUT

1. Identify a business issue in a certain organization
2. Report the detailed study of the problem and its environment
3. Perform Literature Survey
4. Develop a suitable strategy
5. Prepare detailed feasibility study report
6. Present the solution
7. Submit complete report

17MDCEL2- MODELING AND SIMULATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC81

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To simulate Manufacturing systems using R software*
- *To simulate Material Handling systems using R software*
- *To estimate linear and non-linear models to observed data using R software*
- *To apply simulation techniques to real world problems using R software*

TOPICS:

1. Modeling and simulating a Queuing system
2. Modeling and simulating an Inventory system
3. Simulation of a Poisson process.
4. Comparison of Transient and steady state solutions of a Queuing model
5. Generation of random numbers and testing them.
6. Generation of discrete random variates
7. Generation of continuous random variates.
8. Simulation of Manufacturing systems.
9. Simulation of Material Handling systems.
10. Sensitivity analysis of simulation outputs.

TEXT BOOKS

1. *Simulation Model Design and Execution : Building Digital Worlds ,Fishwick, P.A. New Jersey: Prentice Hall Int'l Inc.(1995)*

REFERENCE BOOKS

1. *John M Chambers, "Software for Data Analysis:Programming with R", Springer, 2008*
2. *NarsinghDeo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004,ISBN : 0-87692-028-8.*
3. *G.James,D.Witten, T.Hastie and R.Tibshirani, "An Introduction to Statistical Learning with Applications in R", Springer, 2015.*

15MSSL08 - IMAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

LIST OF EXPERIMENTS

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

15MSSL03 - GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
15MSSE09

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

I COMPUTER GRAPHICS

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

II MULTIMEDIA AND ANIMATIONS: FLASH PROGRAMMING (OR) MAYA

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

15MSSL13 - ADVANCED WEB TECHNOLOGY LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC23, 17MDC26

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Acquire knowledge and skills for creation of web site considering both client and server side programming.*
- *Create responsive web pages using HTML5,CSS3 and BOOTSRAP.*
- *Build richly interactive web pages using AJAX, JSON, and jQuery.*
- *Design and develop fully functional web application using AngularJs, Vue.js and Django.*

CONCEPTS TO BE COVERED

- Create a responsive web page using HTML5, CSS3.
- 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.
- Design and develop Notes application using AngularJS.
- Develop a Blog application using Django.
- Develop a fully functional web application using AngulaJS/Vue.js, Django

16MDS55 - MACHINE LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
15MSSE34

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *To introduce students to the basic concepts and techniques of machine learning.*
- *To develop skills of using recent machine learning software for solving practical problems.*
- *To gain experience of doing independent study and research in machine learning.*

CONCEPTS TO BE COVERED

1. **Supervised Learning : Regression.**
   Generate a proper 2-D data set of N points. Split the data set into Training Data set and Test Data set.
   i) Perform linear regression analysis with Least Squares Method.
   ii) Plot the graphs for Training MSE and Test MSE and comment on Curve Fitting and Generalization Error.
   iii) Verify the Effect of Data Set Size and Bias-Variance Tradeoff.
   iv) Apply Cross Validation and plot the graphs for errors.
   v) Apply Subset Selection Method and plot the graphs for errors. vi) Describe your findings in each case.
2. **Supervised Learning : Classification**
   i) Implement Naïve Bayes Classifier on a Data set . Test for Accuracy and Precision.
   ii) K-Nearest Neighbor Classifier on a Data set . Test for Accuracy and Precision.
3. **Unsupervised Learning**
   i) Implement K-Means Clustering on proper data set.
   ii) Implement Hierarchical clustering on proper data set.
4. **Dimensionality Reduction**
   i) Principal Component Analysis-Finding Principal Components, Variance and Standard Deviation calculations of principal components.
5. **Supervised Learning and Kernel Methods Design**
   Implement SVM for classification with proper data set.

16MDS56 - BIG DATA MODELING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
16MDSE53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Analyze the analytical techniques on variety of Big data application scenarios.*
- *Apply hadoop clusters and map reduce programs for parallel processing of big data.*
- *Practice structured/unstructured data analysis using PIG and HIVE programs.*
- *Experiment the NOSQL operations for processing of big data.*
- *Generate: Generate dynamic solutions for data analytics problems using map reduce framework.*

CONCEPTS TO BE COVERED

1. Import /Export the data from datacenter(website or unstructed)to HDFS
2. Import /Export the data from SQL to HDFS
3. Parallize Input/output process /compute process using MAPREDUCE
4. Storage /Process the data in NOSQL using MongoDB
5. Perform structured/unstructured data analysis using (Internal Map Reduce) PIG
6. Perform structured data process/analysis using HIVE

16MDS85 - DATA VISUALIZATION LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Enhance the ability to understand and communicate data through visualization tools.*
- *Use tools like D3, Shinning to visualize the insights derived from large data.*
- *Explore the various methods to visualize data from various domains.*
- *Design of new interactive systems for data visualization and data analysis.*

Concepts to be Covered:

Softwares Required : D3(HTML, Javascript, CSS) , Shiny tool in R

D3

1. Setting up D3
2. Adding DOM and SVG elements
3. Binding data to DOM elements
4. Using data bound to DOM elements
5. Creating SVG elements based on data
6. Using SVG co-ordinate space
7. SVG basic shapes and D3
8. D3 Scales
9. D3 text element
10. D3 Axes

SHINY TOOL

1. Input and output widgets in shiny
2. Creating dynamic user interface
3. Reactive Programming
4. Interactive Plotting
5. Generating reports
6. Client server programs

16MDS94 - DEEP LEARNING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
16MDS92

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Upon completion of the course, the students will be able to*
- *Demonstrate how traditional feed-forward networks are constructed and why they can approximate almost any function.*
- *Implement the key components in convolutional neural networks (CNNs) and their key advantages.*
- *Describe common types of recurrent neural networks (RNN) and their applications.*
- *Apply popular Deep learning models to their research problems.*

Implement the following concepts using Python and use the necessary libraries like Tensorflow, Keras,Theano, Torch, etc.,

1. Logistic Regression
2. Multilayer perceptron
3. Deep Convolutional Network
4. Linear Factor Models : PCA, ICA etc.
5. Auto Encoders, Denoising Autoencoders
6. Monte Carlo methods
7. Stacked Denoising Auto-Encoders Restricted Boltzmann Machines
8. Deep Belief Networks

15MSS65 - SOFTWARE TESTING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
17MDC53

ASSESSMENT : PRACTICAL

COURSE OUTCOME

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

INTRODUCTION AND PROJECT DEFINITION

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

SOFTWARE REQUIREMENT SPECIFICATION

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

RATIONAL SUITE

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

WIN RUNNER

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

Open source testing software to be used. Tools : J Unit, Selenium

16MDSEL2 - WEB MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES
16MDSE2

ASSESSMENT : PRACTICAL

COURSE OUTCOME

- *Identify and differentiate between application areas for web content mining, web structure mining and web usage mining.*
- *Develop skills of using recent data mining s/w for solving practical problems of web mining.*
- *To apply the use of machine learning techniques for web content mining, the role of hyper links in web structure mining and the various aspects of web usage mining.*

WEB CONTENT MINING

1. Keyword based association analytics
2. Automatic document classification similarity detection
3. Cluster documents containing information from a common source
4. Sequence Analysis: predicting a recurring event
5. Trend Analysis: discovering trends
6. Anomaly detection: find information that violates usual patterns.
7. Discovery of frequent phrases
8. Text segmentation (into logical chunks)
9. Web Data Mining Query Language

a. Covers
b. Covered By
c. Like
d. Close To

WEB STRUCTURE MINING

10. Page Rank
11. Weighted Page Rank
12. Correlation Algorithm for Relevance Ranking
13. Improve structure of a sites web page

WEB USAGE MINING

14. Personalization
15. Determining frequent access behaviour of users
16. Aid in caching and prediction of future page references
17. Improve design of individual pages
18. Gathering Statistics

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DIAMOND JUBILEE

(1956 - 2016)

DEPARTMENT OF COMPUTING

M.Sc. (DECISION AND COMPUTING SCIENCES)

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