



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35



Master of Computer Applications (CA)

About the Department

The department of Computer Applications offers two year Master degree Programme MCA (Master of Computer Applications) started in the academic year 2005 with the intake of 60, and it has emerged into a very successful one. The Programme is designed to provide comprehensive knowledge of computer science, with emphasis on applications. Our students are performed well in academics and richly contributed to the growth of the college by bagging 25 University ranks for the past years. The advancement in technology is challenged by the excellence of Master of Computer Applications, which occupies a prominent place in this college.

The department is provided with excellent academic infrastructure like ICT enabled class rooms, well equipped laboratory with state of the art technology and department library with digital materials. The well qualified, experienced and committed faculty of the department strives for developing new and smart generation of computer professionals with proper transformation of leadership, commitment and moral values. The employability opportunities are more bright and available to the students through regular industry interaction, industry recommended curriculum and development, seminars and workshops and career development courses. The department maintains an exclusive question bank and course notes in digital form prepared by our faculty.

VISION

Our Vision is to emerge as a Centre of Excellence and Research in the field of Computer Education and Application with distinct identity and character in all areas of its dimensions.

MISSION

Our Mission is to provide very high quality education in Computer Applications and thereby develop a new and smart generation of Computer Application Professionals with proper transformation of leadership, commitment and moral values.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

- PEO 1:** To prepare students to excel in postgraduate programmes or to succeed in industry/technical profession through global, rigorous education, and flexible to undertake advance studies in information technology.
- PEO 2:** To provide an academic environment with excellence, leadership, written ethical codes and guidelines, and the enduring learning needed for a successful professional career for students.
- PEO 3:** To provide skills with a firm foundation in Mathematical, Technical and Programming fundamentals require to solve real time problems and also to pursue higher studies.
- PEO 4:** To train students with good technical and managerial skills so as to grasp, analyze, design and develop novel applications and solutions for real time problems.
- PEO 5:** To encourage students in professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach and ability to relate computer applications to broader social context.

PROGRAMME OUTCOMES (PO)

At the end of the program, graduate will be able to:

PO-1	Engineering Knowledge	Apply knowledge of mathematics, computing and management as it applies in the field of software development.
PO-2	Problem Analysis	Identify, formulate, design and solve intricate computing problems, as well as to analyze and interpret data.
PO-3	Design/ Development of solutions	Develop algorithms, implement in programming languages and execute experiments.
PO-4	Conduct Investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO-5	Modern Tool usage	Create and use the techniques, expertise, and modern computing tools necessary to solve complex computing problems.
PO-6	Professional Ethics	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

PO-7	Life-long Learning	Experience life-long learning with a capacity to engage in continuous self-improvement, personal enrichment and professional development.
PO-8	Project management and finance	Demonstrate knowledge and understanding of the project domain and principles, and apply these to manage their project.
PO-9	Communication Efficacy	Effectively communicate technical information, complex computing problems as effective reports, documentation, and make effective presentations.
PO-10	Societal and Environmental Concern	Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.
PO-11	Individual and Team Work	A talent to have a multidisciplinary view with an ability to work effectively as members of a team composed of individuals from different disciplines.

PROGRAM SPECIFIC OUTCOMES (PSO's)

At the end of this program, graduate will be able to:

- PSO 1:** Understand and apply knowledge on analysis, design and development of applications in the computing discipline.
- PSO 2:** Use modern technologies, skill and knowledge for computing practice with commitment on societal, ethical, environmental, cyber and legal values.



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R2023 - CURRICULUM AND SYLLABI

MASTER OF COMPUTER APPLICATION (MCA)

SEMESTER I									
Sl No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Theory Courses									
1	23MAT601	Applied Statistics for Data Analytics	3	0	0	3	3	40/60	FC
2	23CAT601	Data Communication and Network	3	0	0	3	3	40/60	PCC
3	23CAT602	Data structures and Algorithms	3	0	0	3	3	40/60	PCC
4	23CAT603	Database Management System	3	0	0	3	3	40/60	PCC
5	23CAT604	Principles of Management	3	0	0	3	3	40/60	FC
6	23GET601	Professional Development	1	0	2	3	2	40/60	EEC
Practical Courses									
7	23CAP601	Data Structures & Algorithms laboratory	0	0	4	4	2	60/40	PCC
8	23CAP602	Database Management System Laboratory	0	0	4	4	2	60/40	PCC
9	23GEB601	Design Thinking	1	0	4	5	3	0/100	EEC
Total			17	0	14	31	24		

SEMESTER II									
Sl No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Theory Courses									
1	23CAT605	Web Stack Development	3	0	0	3	3	40/60	PCC
2	23CAT606	Java Programming	3	0	0	3	3	40/60	PCC

3	23CAT607	Cross Platform App Development	3	0	0	3	3	40/60	PCC
4	E1	Elective-I	3	0	0	3	3	40/60	PEC
5	O1	Open Elective-I	3	0	0	3	3	40/60	OE
6	23CAT608	Entrepreneurship Development	2	0	0	2	2	40/60	EEC
Practical Courses									
7	23CAP603	Webstack Development Laboratory	0	0	4	4	2	60/40	PCC
8	23CAP604	Java Programming Laboratory	0	0	4	4	2	60/40	PCC
9	23CAP605	App Development Laboratory	0	0	4	4	2	60/40	PCC
10	23CAP606	Mini project	0	0	2	-	1	100/0	EEC
Total			17	0	14	29	24		

SEMESTER III									
Sl No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Theory Courses									
1	23CAT701	Full Stack Development	3	0	0	3	3	40/60	PCC
2	23CAT702	Machine Learning	3	0	0	3	3	40/60	PCC
3	23CAT703	Digital Marketing	3	0	0	3	3	40/60	PCC
4	23CAT704	Cyber Security	3	0	0	3	3	40/60	PCC
5	E2	Elective-II	3	0	0	3	3	40/60	PEC
6	E3	Elective-III	3	0	0	3	3	40/60	PEC
7	23CAT705	Research Methodology	2	0	0	2	2	40/60	RMC
Practical Courses									
8	23CAP701	Full Stack Development Laboratory	0	0	4	4	2	60/40	PCC
9	23CAP702	Data Analytics Laboratory (Python)	0	0	4	4	2	60/40	PCC
Total			20	0	8	28	24		

SEMESTER IV									
Sl No.	Course Code	Course	L	T	P	Contact hrs/week	Credit	Int/Ext	Category
Practical Courses									
1	23CAP703	Project Work	-	-	24	24	12	60/40	EEC
Total					24	24	12		

FOUNDATION COURSES

Sl. No	Course Code	Course	L/T/P	Contact hrs/week	Credits	Semester
1	23MAT601	Applied Statistics for Data Analytics	3/0/0	3	3	I
3	23CAT604	Principles of Management	3/0/0	3	3	III

PROFESSIONAL COURSES

Sl. No	Course Code	Course	L/T/P	Contact hrs/week	Credits	Semester
1	23CAT601	Data Communication and Network	3/0/0	3	3	I
2	23CAT602	Data structures and Algorithms	3/0/0	3	3	I
3	23CAT603	Database Management System	3/0/0	3	3	I
4	23CAP601	Data Structures & Algorithms Laboratory	0/0/4	4	2	I
5	23CAP602	Database Management System Laboratory	0/0/4	4	2	I
6	23CAT605	Web Stack Development	3/0/0	3	3	II
7	23CAT606	Java Programming	3/0/0	3	3	II
8	23CAT607	Cross Platform App Development	3/0/0	3	3	II

9	23CAP603	Web Stack Development Laboratory	0/0/4	4	2	II
10	23CAP604	Java Programming Laboratory	0/0/4	4	2	II
11	23CAP605	App Development Laboratory	0/0/4	4	2	II
12	23CAT701	Full Stack Development	3/0/0	3	3	III
13	23CAT702	Machine Learning	3/0/0	3	3	III
14	23CAT703	Digital Marketing	3/0/0	3	3	III
15	23CAT704	Cyber Security	3/0/0	3	3	III
16	23CAP701	Data Analytics Laboratory (Python)	0/0/4	4	2	III
17	23CAP702	Full Stack Development Laboratory	0/0/4	4	2	III

PROFESSIONAL ELECTIVES

Sl. No	Course Code	Course	L/T/P	Contact hrs/week	Credits
1	23CAE701	Human Resource Management	3/0/0	3	3
2	23CAE702	Data Visualization Techniques	3/0/0	3	3
3	23CAE703	DevOps	3/0/0	3	3
4	23CAE704	Data Science	3/0/0	3	3
5	23CAE705	Accounting and Financial Management	3/0/0	3	3
6	23CAE706	Big Data Analytics	3/0/0	3	3
7	23CAE707	Ethics in Information Technology	3/0/0	3	3
8	23CAE708	Internet of Things	3/0/0	3	3
9	23CAE709	UI/UX Design	3/0/0	3	3
10	23CAE710	Digital Forensics	3/0/0	3	3
11	23CAE711	Artificial Intelligence	3/0/0	3	3
12	23CAE712	Optimization Techniques	3/0/0	3	3
13	23CAE713	Block Chain Technology	3/0/0	3	3
14	23CAE714	Social Network Analytics	3/0/0	3	3
15	23CAE715	Deep Learning	3/0/0	3	3
16	23CAE716	Data Mining and Data Warehousing Techniques	3/0/0	3	3
17	23CAE717	Cloud Computing	3/0/0	3	3
18	23CAE718	Agile Software Development	3/0/0	3	3
19	23CAE719	NoSQL Database system	3/0/0	3	3
20	23CAE720	Information Security	3/0/0	3	3

EMPLOYEE ENHANCEMENT COURSES

Sl. No	Course Code	Course	L/T/P	Contact hrs/week	Credits	Semester
1	23GET601	Professional Development	1/0/2	3	2	I
2	23GEB601	Design Thinking	1/0/4	5	3	I
3	23CAT608	Entrepreneurship Development	2/0/0	2	2	II
4	23CAP606	Mini project	0/0/2	-	1	II
5	23CAP703	Project Work	0/0/24	24	12	IV

OPEN ELECTIVES

Sl. No	Course Code	Course	L/T/P	Contact hrs/week	Credits
1	23CAOE1	Social Media Analytics	3/0/0	3	3
2	23CAOE2	Web Content Management	3/0/0	3	3
3	23CAOE3	Business Intelligence for Managers	3/0/0	3	3

CREDITS PER SEMESTER & CREDITS PER CATEGORY

Category / Semester	FC	PCC	PEC	EEC	OE	Total
I	6	13	-	5	-	24
II	-	15	3	3	3	24
III	-	16	6	2	-	24
IV	-	-	-	12	-	12
TOTAL	6	44	9	22	3	84

23MAT601	APPLIED STATISTICS FOR DATA ANALYSIS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To impart the knowledge on basics of statistics, distributions and measures like central tendency and dispersion. To expose the statistical methods for analysis of variance and control limits. 							
UNIT I	STATISTICAL DATA REPRESENTATIONS						9
Frequency distributions of data: cumulative and relative frequency distributions- Graphical representation of data – Pie charts, Bar graphs, Histogram, Frequency Polygon and Ogives.							
UNIT II	QUANTITATIVE STATISTICAL MEASURES						9
Measures of Central tendency: Arithmetic Mean, Median, Mode - Measures of Dispersion: Range, Quartile deviation, Standard deviation, Variance and Co-efficient of Variation.							
UNIT III	TESTING OF HYPOTHESIS						9
Sampling distributions – Testing of hypothesis for large samples by Z-test and small samples by Student's t-test for single Mean, Proportion, equality of means and equality of proportions – F- test for single variance and equality of variances – Chi-square test for Goodness of fit and Independence of attributes.							
UNIT IV	DESIGN OF EXPERIMENTS						9
ANOVA(Analysis of variance) – Completely Randomized Design(CRD-one way classification)– Randomised Block Design (RBD-two way classification) - Latin Square Design (LSD-Three way classification) - Control charts for measurements: mean chart or \bar{x} - chart, R- chart.							
UNIT V	DATA ANALYSIS						9
Correlation analysis : Karl Pearson's Coefficient of Correlation - Regression Analysis: Least Square fit of a Linear Regression -Two lines of Regression - Multivariate Analysis: Random vectors and matrices - mean vectors and covariance matrices – multivariate normal density function- Principal Component Analysis - Population Principal Components.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Gupta.S.C.,&Kapoor,V.K., “Fundamentals of mathematical statistics”, 11th edition, Sultan Chand & Sons publishers, New Delhi, 2013.						
T2	Levin R.I., Rubin S. David, “Statistics for Management”, Eight edition, Pearson, 2017. [e-resource: Levin R.I., Rubin S. David, “Statistics for Management”, Pearson, 2019].						
REFERENCES							
R1	Veerarajan.T., “Probability, Statistics and Random Processes”, Tata McGraw-Hill publishing company Limited, New Delhi, 2014.						
R2	R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, “Probability and Statistics for Engineers and Scientists”, Pearson Education, Asia , 8th edition, 2007.						
R3	Miller and Freund., “Probability and Statistics for Engineers”, Pearson Education, Asia, 7th edition, 2012.						
R4	Arora.P.N. and Arora.S., “Statistics for Management”, S.Chand& Company Ltd, 2009.						
R5	Keller, G, “Statistics for Management and Economics”, Cengage Learning (Textbook/ eBook), 2019.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Identify statistical data using bar graphs, pie graphs, histograms, frequency polygons and ogives.
CO 2	Evaluate the measure of Central tendencies and Dispersion of the frequency distributions of data.
CO 3	Apply conclusions through hypothesis testing.
CO 4	Plan with the knowledge of analysis of variance for decision making and analyse the control limits of a sample.
CO 5	Applying data analysis such as Correlation, Regression, Principal Component analysis with statistical tools

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	3	3			2				1			1	
C02	3	3			2				1			1	
C03	3	3		2	2				2			2	
C04	3	3		2	2				2			2	
C05	3	3		2	2				2			2	

23CAT601	DATA COMMUNICATION AND NETWORK	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To understand the basic concepts of computer networks and data communication To explore knowledge on network protocols and standards 						
UNIT I	DATA COMMUNICATION					9
Introduction: Networks – Protocols and standards – Standards organizations – Line configurations – Topology – Transmission mode – Categories of networks – Inter networks.OSI model: Functions of the layers. Encoding and modulating: Digital-to-digital conversion – Analog-to-digital conversion – Digital-to-analog conversion –Analog-to-analog conversion. Transmission media: Guided media – Unguided media – Transmission impairment – Performance						
UNIT II	ERROR CONTROL AND DATA LINK PROTOCOLS					9
Error detection and correction: Types of errors – Detection – Vertical Redundancy Check (VRC) – Longitudinal Redundancy Check (LRC) – Cyclic Redundancy Check (CRC) –Check sum – Error correction. Data link control: Line discipline – Flow control – Error control. HDLC, Project 802 – Ethernet – Token ring – FDDI- SONET – Bridges.						
UNIT III	NETWORKS AND SWITCHING, NETWORKING DEVICES					9
Switching: Circuit switching – Packet switching – Message switching. Internetworks- IP addressing methods – Subnetting –Networking and internetworking devices: Repeaters – Bridges – Gateways – Other devices – Routing algorithms – Distance vector routing – Link state routing.						
UNIT IV	TRANSPORT LAYER AND APPLICATION LAYER					9
Duties of transport layer – Multiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS).Domain Name Space (DNS) – SMTP – FTP – HTTP – WWW						
UNIT V	NETWORK SECURITY AND APPLICATIONS					9
Network Security and Applications Cryptographic Building Blocks, Key Pre-distribution, Firewalls, Traditional Applications, Infrastructure Services.						
		L:45	T:0	P: 0	Total: 45 Periods	
TEXT BOOKS						
T1	BehrouzA.Forouzan, “Data Communication and Networking”, 5th Edition, Tata McGraw Hill, 2012.					
T2	Andrew Tannenbaum.S, “Computer Networks”, 5th Edition, Pearson Education, 2011.					
REFERENCES						
R1	William Stallings, “Data and Computer Communication”, 10th Edition, Pearson Education, 2013					
R2	Larry L Peterson and Bruce S Davie, Computer Networks A Systems Approach, 5th Edition, MKP – 2012.					

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Critique Data Communications System and its components.
CO 2	Identify the different types of network topologies and protocols.
CO 3	Analyze the layers of the OSI model and TCP/IP and identify the different types of Network devices and their functions within a network.
CO 4	Outline the use of various networking devices.
CO 5	Evaluate the role of application layer protocols in different scenarios

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2					2				2	3	2
C02		2			3		2				2	3	2
C03		2			3		2				2	3	2
C04		2			3		2				2	3	2
C05		2			3		2				2	3	2

23CAT602	DATA STRUCTURES & ALGORITHMS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand and apply linear data structures-List, Stack and Queue To analyze the efficiency of algorithm using asymptotic notations 							
UNIT I	ELEMENTARY DATA STRUCTURES						9
Introduction – Arrays – Structures – Stack: Definition and examples, Representing Stacks - Queues and lists: Queue and its Representation, lists – Applications of Stack, Queue and Linked Lists.							
UNIT II	TREES						9
Binary Trees – Operations on binary trees - Binary Tree Representations – node representation, internal and external nodes, implicit array representation – Binary tree Traversals - Huffman Algorithm – Representing Lists as Binary Trees							
UNIT III	SORTING AND SEARCHING						9
General Background – Exchange sorts – Selection and Tree Sorting – Insertion Sorts – Merge and Radix Sorts – Basic Search Techniques – Tree Searching – General Search Trees – Hashing							
UNIT IV	GREEDY AND BACKTRACKING						9
Fundamentals of the analysis of algorithm efficiency - Asymptotic notations - Greedy method – Prim’s algorithm – Kruskal’s algorithm – Dijkstra’s algorithm – Backtracking: N-Queens problem							
UNIT V	NP-HARD AND NP-COMPLETE PROBLEMS						9
P & NP problems – NP-complete problems – Approximation algorithms for NP-hard problems – Traveling salesman problem – Knapsack problem							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Tanaenbaum A.S., Langram Y. Augestein M.J “Data Structures using C”, Pearson Education , 2008.						
T2	AnanyLevitin “Introduction to the Design and Analysis of Algorithms” Pearson Education 2012.						
REFERENCES							
R1	Robert Kruse & Clovis L. Tondo “Data Structures and Program Design in C”, Prentice Hall , 2nd edition., 2007.						
R2	M.K.Venkataraman “Engineering Mathematics”, Volume II, National Publishing Company, Second Edition,1989.						
R3	A.Tamilarasi&A.M.Natarajan, “Discrete Mathematics and its Application”, Khanna Publishers, Second Edition, 2005.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Apply knowledge to describe array, stack, queue and linked list operation.
CO 2	Demonstrate different types of trees and apply them to problem solutions
CO 3	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data
CO 4	Apply backtracking method in real cases
CO 5	Utilize the use of NP hard and NP Complete problems

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	2					3	2			2	3	
C02	2	2			3		3	2			2	3	
C03	3	3	3		3		3	3			2	3	3
C04	3	3	3		3		3	3			2	3	3
C05	3	3	3		3		3	3			2	3	3

23CAT603	DATABASE MANAGEMENT SYSTEMS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the fundamentals of data models and database design To impart knowledge on query language and apply the same in real cases 							
UNIT I	INTRODUCTION						9
File systems versus Database systems – Data Models – DBMS Architecture – Data Independence – Data Modeling using Entity – Relationship Model –E-R Modeling.							
UNIT II	RELATIONAL MODEL AND QUERY EVALUATION						9
Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints.							
UNIT III	DATABASE DESIGN & APPLICATION DEVELOPMENT						9
Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.							
UNIT IV	ADVANCED SQL AND TRANSACTION MANAGEMENT						9
Complex Queries, Triggers, Views, and Schema Modification More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL, Schema Change Statements in SQL							
UNIT V	COLUMN ORIENTED DATABASE						9
Definition of NOSQL- NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Raghu RamaKrishnan and Johannes Gehrke, “Database Management Systems”, McGraw Hill International Editions, 2000.						
T2	Shakuntala Gupta Edward, NavinSabharwal, “Practical MongoDB, Architecture, Developing and Administrating MongoDB”, Apress, 2015						
REFERENCES							
R1	C. J. Date, “An Introduction to Database Systems”, Seventh Edition, Addison Wesley, 1997.						
R2	Abraham Silberschatz, Henry. F. Korth and S. Sudharshan, “Database system Concepts”, Third Edition, Tata McGraw Hill, 1997.						
R3	Hector Garcia- Molina, Jeffrey D Jennifer widom, “Database Systems – The complete book”, Pearson Education, 2nd edition, 2008.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Outline the basics of the data models and database using ER diagrams
CO 2	Predict the knowledge of query evaluation to monitor the performance of the DBMS
CO 3	Apply normalization in the relations during database design
CO 4	To impart knowledge in transaction processing, concurrency control techniques and recovery procedures
CO 5	Prepare column oriented database and apply the database operations in the open source database management system

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		1	2				2					2	2
C02		1	2				2					3	2
C03		2	2		2		2	2		2		2	2
C04		3	3		2		3	2		2		3	2
C05		3	3		2		3	2		2		3	2

23CAT604	PRINCIPLES OF MANAGEMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Enable the students to study the evolution of Management and its functions • Learn the application of the principles in an organization 							
UNIT I	INTRODUCTION TO MANAGEMENT						9
Management: Definition - Evolution of Management Studies –Nature, Functions, Levels and role of management - Basic Principles and Process of Management - Management vs. Administration - Taylor & Fayol's contribution to Management - Management styles -Qualities of good manager.							
UNIT II	PLANNING						9
Planning: Basic types of planning – Characteristics of a good plan- Features - Planning process- Obstacles in planning - MBO, MBE, Policy - Policy formulation - Types of policies - Forecasting, Process, Importance – Decision making process.							
UNIT III	ORGANISING						9
Organization: Need - forms of organization - features of a good organization. Departmentation – organizational charts - manuals - span of management, factors affecting span of management - authority relationship – delegation of authority and responsibility - centralization and decentralization.							
UNIT IV	STAFFING & DIRECTING						9
Staffing: Meaning, Nature, Need, and Process. Directing - Characteristics, Importance and Techniques of directing. Event & Time Management - Scope, Importance - Coordination - Need for coordination, Techniques for securing effective coordination.							
UNIT V	CONTROLLING						9
Concept of Control – Importance of control- Essentials of control system - Process of control – Communication - Process of Communication - Types - Barriers - Management Information Systems.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Harold Koontz, and Weihrich, “Essentials of Management”, 8th Edition, 2010						
REFERENCES							
R1	Tripathy.P.C and Reddy.P.N., “Principles of Management” , 4th Edition, Tata McGraw Hill, 2011.						
R2	Stephen.P.Robbins, Mary coulter, Neharikavohra, Pearson, Management, 10th Edition, 2010.						
R3	Dr.Kumkum Mukherjee, Principles of Management, 2nd Edition, Tata McGraw Hill, 2009.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Predict various functions of management
CO 2	Prepare an effective team member and leader.
CO 3	Effectiveness of organizing and controlling aspects of management.
CO 4	Apply problem-solving strategies and critical thinking in real life situations.
CO 5	Plan to understand the significance of communication in business.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01						2	2						1
C02						2	3				3		2
C03						2	3		2		3		1
C04						3	3		3		3		3
C05						3	2		3		3		3

23GET601	PROFESSIONAL DEVELOPMENT			L	T	P	C
				1	0	2	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Develop creativity and effective communication • Advance the students' intellectual curiosity, competency and skills using networking and socialization 							
UNIT I	PROFESSIONAL COMMUNICATION						9
Importance of communication- Types of communication- Verbal and Non-verbal Communication - Barriers to communication.							
UNIT II	PERSONALITY DEVELOPMENT						9
Significance of Personality development- Attitude - Motivation-Self Esteem-Body language - Problem-solving- Decision-making skills- Leadership qualities-Character building -Team-work - Work ethics -Good manners and etiquette.							
UNIT III	PUBLIC SPEAKING						9
Introduction to public speaking- Barriers- Speech organization-Understanding audience-Information & Communicative Technologies (ICT)-Effective power point presentation-feedback							
UNIT IV	NETWORKING						9
Introduction to networking-Types of networking- Business Card- strategies for networking-networking database-Role of social media& internet							
UNIT V	SOCIALIZATION						9
Importance of socialization-Theories of self-development-Agents of socialization-socialization across the life							
				L:15	T:0	P: 15	Total: 30 Periods
TEXT BOOKS							
T1	Personality development- 1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.						
T2	Stephen P. Robbins and Timothy A. Judge(2014), Organizational Behaviour 16th Edition: Prentice Hall						
REFERENCES							
R1	Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Utilize effective verbal and written communication skills
CO 2	Exhibit an understanding of ethical principles and professional behavior
CO 3	Identify key leadership principles and demonstrate the ability to work collaboratively within diverse teams.
CO 4	Assess utilize networking opportunities to build professional relationships
CO 5	Predict communicate effectively, cooperate, and interact positively with others,

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01						3	3		3		3		1
C02						3	3		3		3		2
C03						3	3		3		3		
C04						3	3		3		3		3
C05						3	3		3		3		3

23CAP601	DATA STRUCTURES & ALGORITHMS LABORATORY			L	T	P	C
				0	0	4	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Apply skills to choose appropriate data structures for problem solving. Assess on how the choice of data structures and algorithm design methods influence the performance of programs. 							
LIST OF EXPERIMENTS							
<ol style="list-style-type: none"> Strassen's matrix multiplication Stack and Queue Merge Sort Quick Sort Binary tree Traversals DFS and BFS Prim's Algorithm Knapsack Problem – Dynamic Programming Subset Sum Problem – Backtracking Travelling salesperson problem – Branch and Bound 							
MAJOR EQUIPMENTS / SOFTWARE REQUIRED							
Hardware							
<ul style="list-style-type: none"> Intel Pentium IV Processor, Intel Mother Board, 2 GB RAM, 125 GB Hard Disk or above 							
Software							
<ul style="list-style-type: none"> Windows 7/ Higher OS C Compiler 							
				L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Design and analyze the time and space efficiency of the data structure.
CO 2	Utilize practical knowledge on the applications of data structure.
CO 3	Analyze and implement the various algorithms.
CO 4	Demonstrate dynamic programming concepts and write programs
CO 5	Plan to write programs implementing backtracking and branch & bound approaches

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	2	2		2		2	2		1	2	2	2
C02	2	2	2		2		2	2		1	2	2	2
C03	3	3	3		3		2	2		2	3	2	3
C04	3	3	3		3		3	3		3	3	2	3
C05	3	3	3		3		3	3		3	3	2	3

23CAP602	DATABASE MANAGEMENT SYSTEM LABORATORY			L	T	P	C
				0	0	4	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Ability to define a conceptual and physical design of data mode for application programs. • Apply SQL Statements to access and manage database using procedure, cursor, trigger and functions. 							
LIST OF EXPERIMENTS							
<ol style="list-style-type: none"> 1. Creation of base tables and views. 2. Data Manipulation : a) INSERT, DELETE and UPDATE in tables b) SELECT, Sub Queries and JOIN 3. Data Control Commands. 4. High level language extensions – PL/SQL Or Transact SQL. 5. Use of Cursors, Procedures and Functions. 6. Embedded SQL or Database Connectivity. 7. Develop Triggers. 8. Create the schema in a document database, add a key and insert data 9. Create cricket database with necessary information. <ol style="list-style-type: none"> (i) List all the records (ii) Search for particular player using ID (iii) List the player having batting average 40 and above (iv) List the player who have scored 1000 and apply to find list of all the records in the world cup 10. Case 1: Students Information System 11. Case 2: Call Taxi Management system 12. Case3: Start NoSQL Database instance and load the user profile data <p>MAJOR EQUIPMENTS / SOFTWARE REQUIRED</p> <p>Hardware</p> <ul style="list-style-type: none"> • Intel Pentium IV Processor, • Intel Mother Board,2 GB RAM, • 125 GB Hard Disk or above <p>Software</p> <ul style="list-style-type: none"> • Windows 7/ Higher OS • Microsoft SQL Server/ Oracle/ MySQL 							
				L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Creation of tables, queries, forms, reports, data access pages, & macros.
CO 2	Prepare comprehensive instruction in the SQL and transact-SQL for Microsoft's SQL Server users.
CO 3	Design multiple forms and reports using PL/SQL triggers, the Object Navigator, and Oracle's Form & Report Builders.
CO 4	Evaluate triggers and procedures for effectively utilizing the backend for application Development.
CO 5	Apply visual basic technology for application development.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2	2		2		2	2		1	2	2	2
CO2		2	2		2		2	2		1	2	2	2
CO3		3	3		3		2	2		2	3	2	3
CO4		3	3		3		3	3		3	3	2	3
CO5		3	3		3		3	3		3	3	2	3

23GEB601	DESIGN THINKING			L	T	P	C
				1	0	4	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Identify empathize and solve a challengeable problems Conceive and articulate design thinking approach to solve challengeable problems. 							
UNIT I	INTRODUCTION TO DESIGN THINKING						9
A brief insight to Design Thinking and Innovation- People Centered Design & Evoking the 'right problem'- Purpose of Design Thinking- Design Thinking Framework							
UNIT II	PROCESS IN DESIGN THINKING (EMPATHY, DEFINE)						9
Design Thinking Process – Empathy – Uncovering and Investigating Community Concerns - Define : Examine and Reflect on the problem							
UNIT III	CONCEPTING AND BUILDING (IDEA, CREATE)						9
Generating Ideas- Identifying top three ideas- Bundling the Ideas and create concepts - Rapid Prototyping							
UNIT IV	TESTING, REFINING AND PITCHING THE IDEAS						9
Importance & Testing the Design with People-Retest and Redefine Results-Creating a Pitch for the design							
UNIT V	VALUE PROPOSITION DESIGN						9
Business Vs Startup-Briefing the Problem-Problem Validation and User Discovery- Challenge Brief							
				L:15	T:0	P: 0	Total: 30 Periods
TEXT BOOKS							
T1	Robert A Curedale, Design Thinking Process & Methods 4th Edition, December 2017, Design Community College Inc.						
T2	Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.						
REFERENCES							
R1	IdrisMootee, Design Thinking for Strategic Innovation - What They Can't Teach You at Business or Design School, First Edition, 2017, Wiley						
R2	Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos Alex Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want, 2015, Wiley						
R3	Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Business						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Learn new approach-design thinking—that enhances innovation activities in terms of market impact, value creation, and speed.
CO 2	Feel the Empathy and can define their problems based on the Community Concerns
CO 3	Strengthen their individual and collaborative capabilities to identify customer needs, create sound concept hypotheses, collect appropriate data, and develop a prototype that allows for meaningful feedback in a real-world environment
CO 4	Translate broadly defined opportunities into actionable innovation possibilities and recommendations for client organization
CO 5	Become an Entrepreneurs

23CAT605	WEBSTACK DEVELOPMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Prepare to use cloud technologies and data format for making web applications. • Utilize server side technology and mysql to develop modern server applications. 							
UNIT I	OVERVIEW OF WEB TECHNOLOGIES AND HTML5						9
Internet and web Technologies- Client/Server model -Web Search Engine-Web Crawling-Web Indexing-Search Engine Optimization and Limitations-Web Services –Collective Intelligence –Mobile Web –Features of Web 3.0-HTML vs HTML5-Exploring Editors and Browsers Supported by HTML5-New Elements-HTML5 Semantics-Migration from HTML to HTML5-Canvas-HTML Media							
UNIT II	XML AND AJAX						9
Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express.							
UNIT III	CLIENT SIDE SCRIPTING						9
JavaScript Implementation - Use Javascript to interact with some of the new HTML5 apis -Create and modify Javascript objects- JS Forms - Events and Event handling-JS Navigator-JS Cookies-Introduction to JSON-JSON vs XML-JSON Objects-Importance of Angular JS in web-Angular Expression and Directives							
UNIT IV	SERVER SIDE SCRIPTING						9
Essentials of PHP- Installation of Web Server,XAMPP Configurations-PHP Forms- GET and POST method - Regular Expressions-Cookies- Sessions- Usage of Include and require statements- File:read and write from the file-PHP Filters-PHP XML Parser-Introduction to Node.js-Node.js Modules and filesystem-Node.js Events							
UNIT V	MySQL and MEAN STACK						9
PHP with MySQL- Performing basic database operation(DML) (Insert, Delete, Update, Select)- Prepared Statement- Uploading Image or File to MySQL- Retrieve Image or File from MySQL- Uploading Multiple Files to MySQL-Introduction to MEAN and FULL Stack-Real time example for modern web applications using MEAN-MEAN vs Full StackProgramming.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), DT Editorial Services, DreamtechPress,Second Edition,2016						
T2	Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas.						
T3	Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating.						
REFERENCES							
R1	Web-Stack JavaScript Development by Eric Bush.						
R2	Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl, KamilPrzeorski ,MaciejCzarneck.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Able to develop rich web page content using HTML5
CO 2	Design web application to prepare, transfer and parse XML and JSON format data.
CO 3	Explore advanced JS technologies to develop application with events management.
CO 4	Gain knowledge on server side technologies and built client server applications
CO 5	Use MySQL technologies and its features for analytical applications with the help of full stack programming.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2			3		3	3			1	2	2
C02			3		3	2	3		2		2	2	2
C03			3		3	2	3		2		3	3	3
C04			3		3	2	3		2		3	3	3
C05			3		3	2	3		2		3	3	3

23CAT606	JAVA PROGRAMMING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Explore the features of java to develop server side applications and dynamic applications using JDBC Provide a strong foundation on Spring framework for developing java applications 							
UNIT I	JAVA FUNDAMENTALS						9
Java features – Java Platform – Java Fundamentals – Classes, Packages and Interfaces – Exception Handling – utilities and collections.							
UNIT II	PACKAGES						9
Applets- AWT package – Layouts – Containers – Event Package – Event Model – Painting – Garbage Collection.							
UNIT III	NETWORKING AND I/O PACKAGES						9
Multithreading – Network programming - InetAddress - URL - TCP/IP and datagram - Input Output Packages - inner classes - Java Database Connectivity: drivers - connection- query execution – Servlets: Generic servlet - HttpServlet							
UNIT IV	ADVANCED JAVA PROGRAMMING						9
RMI – Java Beans – Introduction- Difference between AWT and SWING - Components hierarchy- Panes - Individual Swings components J Label - JButton, JTextField, JtextAres							
UNIT V	JAVA WEB FRAMEWORKS: SPRING MVC						9
Spring: Introduction, Architecture, Spring MVC Module, Life Cycle of Bean Factory, Explore: Constructor Injection, Dependency Injection, Inner Beans, Aliases in Bean, Bean Scopes, Spring Annotations, Spring AOP Module, Spring DAO, Database Transaction Management, CRUD Operation using DAO and Spring API.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Herbert Schildt, The Complete Reference – Java 2, 8th Edition, Tata McGraw Hill, 2011.						
REFERENCES							
R1	Ralph Bravaco, Shai Simonson, “Java Programming : From the Ground Up”, Tata McGraw Hill Edition, 2012.						
R2	Keyur shah, “Gateway to Java Programmer Sun Certification”, Tata McGraw Hill 2002.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Able to develop and execute Java programs using object oriented programming concepts.						
CO 2	Design user interface program using applets and events package.						
CO 3	Understand the use of networking and I/O packages.						
CO 4	Able to apply the swing components for UI Applications						
CO 5	Able to develop Java Application using spring framework						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	2					3	2			2	3	2
C02	2	2			3		3	2			2	3	2
C03	3	3	3		3		3	3			2	3	3
C04	3	3	3		3		3	3			2	3	3
C05	3	3	3		3		3	3			2	3	3

23CAT607	CROSS PLATFORM APP DEVELOPMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Learn about the features and installation of Flutter Learn about the basic programming constructs of Dart Develop simple mobile applications in Flutter using Dart language Develop mobile applications using database Connections 							
UNIT I	INTRODUCTIONS						9
Responsive Web design - Cross-platform App - Benefits - Criteria for creating Cross-platform App, - Tools - Popular Cross platform App Development Frameworks.							
UNIT II	FLUTTER BASICS						9
Widgets- Gestures- Concept of State- Layers- Introduction to Dart Programming-Variables and Data types- Decision Making and Loops. Functions- Object Oriented Programming. Introduction to Widgets- Widget Build Visualization.							
UNIT III	INTRODUCTION TO LAYOUTS						9
Type of Layout Widgets- Single Child Widgets- Multiple Child Widgets- Advanced Layout Application- Introduction to Gestures- State Management in Flutter. Ephemeral State Management- Application State - scoped model- Navigation and Routing.							
UNIT IV	ANIMATION ON FLUTTER						9
Introduction to Animation Based Classes-Work flow of the Flutter Animation- Working Application- Android Specific Code on Flutter- Introduction to Package- Types of Packages Using a Dart Package- Develop a Flutter Plugin Package- Accessing Rest API- Basic Concepts- Accessing Product service API							
UNIT V	DATABASE CONCEPTS						9
SQLite- Cloud Fire store- Internationalization on Flutter- Using intl Package-Testing on FlutterTypes of Testing- Widget Testing- Steps Involved- Working Example-Deployment- Android Application- IOS Application- Development Tools- Widget Sets- Flutter Development with Visual Studio Code- Dart DevTools- Flutter SDK.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan,(ISBN-10: 1507823207)						
T2	Flutter in action, written by Eric Windmill, January 2020, Manning shelter Island, ISBN 9181617296147.						
T3	Dart Programming for Flutter, written by Carmine Zaccagnino, Feb -2020, Publisher: Pragmatic Bookshelf, ISBN: 9781680506952.						
REFERENCES							
R1	Flutter Cookbook: Over 100 Proven techniques and solutions for Development with flutter 2.2 and Dart, 2nd Edition, by Ivo Balbaert, DzenanRidjanovic, Packet Publishing, ISBN 10: 1785287621.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Install Flutter in Android Studio
CO 2	Build simple Flutter application using simple widgets and layouts
CO 3	Build Animation on Flutter
CO 4	Develop Flutter applications using Dart packages
CO 5	Construct Flutter application using database

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2			3		3	3			1	2	2
C02			3		3	2	3		2		2	2	2
C03			3		3	2	3		2		3	3	3
C04			3		3	2	3		2		3	3	3
C05			3		3	2	3		2		3	3	3

23CAT608	ENTREPRENEURSHIP DEVELOPMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Enable the students to understand Entrepreneurship and prepare business plan • Apply 21st century skills to develop business and protect innovation through IPR 							
UNIT I	INTRODUCTIONS						9
Entrepreneurship and Enterprise - Objectives of Entrepreneurship Development - Phases of Entrepreneurship Development - Role of Entrepreneurship, The Entrepreneurial Mindset, Characteristics of Entrepreneurship, Traits of Entrepreneurship, Introduction to Entrepreneurship Skills-Social Entrepreneurship- Rural entrepreneurship - Women entrepreneurship							
UNIT II	PROJECT PLANNING						9
Search for Business Idea, Product Innovations, New Product Development – Stages in Product Development; Sequential stages of Project Formulation; Feasibility analysis – Technical, Market, Economic, Financial etc.; Project report; Project appraisal; Setting up an Industrial unit – procedure and formalities in setting up an Industrial unit; Business Plan Development							
UNIT III	INNOVATION AND INCUBATION						9
Innovation and Entrepreneurship, Creativity, Green Technology Innovations, Grassroots Innovations, Issues and Challenges in Commercialization of Technology Innovations, Introduction to Technology Business Incubations, Process of Technology Business Incubation							
UNIT IV	PROTECTION OF INNOVATION THROUGH IPR						9
Introduction to Intellectual Property Rights – IPR, Patents, Trademarks, Copy Rights							
UNIT V	FUNDING AND SUPPORT						9
Institutions supporting small business enterprises, Angel investors & venture capitalist							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Desai Vasant, Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, India, 6th Revised Edition, 2020						
T2	Charantimath P. M., Entrepreneurial Development and Small Business Enterprises, Pearson Education, 3rd Edition, 2018						
REFERENCES							
R1	Holt David H., Entrepreneurship: New Venture Creation, Pearson Education, 2016						
R2	Prasad L.M., Principles & Practice of Management, Sultan Chand & Sons, 8th Edition, 2015						
R3	Banga T. R. & Sharma S.C., Industrial Organisation & Engineering Economics, Khanna Publishers, 25th Edition, 2015						
R4	Chandra P, Projects: Planning, Analysis, Selection, Financing, Implementation and Review, Tata McGraw Hill, 9th Edition, 2019						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Gain knowledge on role of entrepreneur and its various types
CO 2	Prepare business plan, perform analysis and setting up business
CO 3	Apply innovation, technology, creativity to succeed in business
CO 4	Use IPR and other security mechanism to protect the business innovations
CO 5	Know about the availability of funding and investments for scaling up business

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
C01						2	2		2				
C02		3											
C03		2			3					3		2	3
C04						3						2	3
C05			3			3				3		3	3

23CAP603	WEBSTACK DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Prepare the students to use server technologies to develop web based applications • Apply advanced scripting technologies to build cloud based web applications 					
LIST OF PROGRAMS					
<ol style="list-style-type: none"> 1. Develop a portfolio website for yourself which gives details about yourself for a potential recruiter. 2. Create a web application to manage the TO-DO list of users, where users can login and manage their to-do items 3. Create a simple micro blogging application (like twitter) that allows people to post their content which can be viewed by people who follow them. 4. Create a food delivery website where users can order food from a particular restaurant listed in the website. 5. Develop a classifieds web application to buy and sell used products. 6. Develop a leave management system for an organization where users can apply different types of leaves such as casual leave and medical leave. They also can view the available number of days. 7. Develop a simple dashboard for project management where the statuses of various tasks are available. New tasks can be added and the status of existing tasks can be changed among Pending, InProgress or Completed. 8. Develop an online survey application where a collection of questions is available and users are asked to answer any random 5 questions. 					
Hardware Requirements					
Intel Pentium IV Processor,					
Intel Mother Board,					
4 GB of RAM					
80 GB Hard Disk or above					
Software Requirements					
Windows XP Operating System / Linux Operating System					
Browser (Edge /Netscape/Mozilla)					
WAMP/XAMPP server					
		L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Able to develop web application with simple functionalities
CO 2	Design an application to transfer the data between pages via sessions
CO 3	Prepare server side application to handle events.
CO 4	Develop server side pages and information retrieval using React JS
CO 5	Create analytical application with full stack programming and MySQL

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	2	2		2		2	2		1	2	2	2
C02	2	2	2		2		2	2		1	2	2	2
C03	3	3	3		3		2	2		2	3	2	3
C04	3	3	3		3		3	3		3	3	2	3
C05	3	3	3		3		3	3		3	3	2	3

23CAP604	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Prepare students to make use of java features to develop modern applications • Utilize the MVC framework to develop applications using GUI components 					
LIST OF PROGRAMS					
<ol style="list-style-type: none"> 1. Write a java program to implement <ul style="list-style-type: none"> • Function overloading • Inheritance • Exception handling 2. Java program to implement package and interface 3. Create a Graphical User Interface for Employee Management System using AWT components 4. Writing a GUI program with event classes. 5. Write a Java program to implement network sockets. 6. Create a program to manage a basic library system, with functionalities like adding a new book, displaying all books and searching for a book by title using JDBC. 7. Write a Java program that demonstrates the use of RMI for a simple remote calculator service. The server should have methods for addition, subtraction, multiplication, and division. The client should invoke these methods on the remote server. 8. Develop a login authentication system using Swing. Design a login screen with JTextField for username, JPasswordField for password, and JButton for login. Validate the entered credentials against a predefined set. 9. Develop a basic Spring MVC web application. Create a controller, model, and a view using JSP. Implement features like handling form submissions, displaying data from the model, and handling user requests. <p>Hardware Requirements Intel Pentium IV Processor, Intel Mother Board, 512 MB RAM, 80 GB Hard Disk or above</p> <p>Software Requirements Windows XP Operating System / Linux Operating System Java SDK (1.8) / Tomcat Server / IIS Server, Eclipse Browser (IE /Netscape/Mozilla)</p>					
		L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES**At the end of the course students should be able to****CO 1** Able to develop simple Java program with Object oriented programming.**CO 2** Able to develop GUI using Applet and AWT components.**CO 3** Able to develop remote applications with database technology.**CO 4** Able to write client server programs using RMI.**CO 5** Able to develop and deploy MVC framework.**Mapping of Programme Outcomes / Programme Specific Outcomes**

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
	CO1	2	2	2		2		2	2		1	2	2
CO2	2	2	2		2		2	2		1	2	2	2
CO3	3	3	3		3		2	2		2	3	2	3
CO4	3	3	3		3		3	3		3	3	2	3
CO5	3	3	3		3		3	3		3	3	2	3

23CAP605	APP DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Employ the best features of flutter on mobile app development with responsive web design • Implement mobile application by applying web services 					
LIST OF PROGRAMS					
<ol style="list-style-type: none"> 1. Study and installation of Flutter/Kotlin multi-platform environment 2. Develop an application that uses Widgets, GUI components, Fonts, and Colors. 3. Develop a native calculator application. 4. Develop a gaming application that uses 2-D animations and gestures. 5. Develop a movie rating application (similar to IMDB) 6. Develop an application to connect to a web service and to retrieve data with HTTP. 7. Develop a simple shopping application. 8. Design a web server supporting push notifications. 9. Develop an application by integrating Google maps. 10. Mini Projects involving Flutter/Kotlin multi-platform 					
Hardware Requirements					
Intel Pentium IV Processor, Intel Mother Board, 512 MB RAM, 80 GB Hard Disk or above					
Software Requirements					
Windows XP Operating System / Linux Operating System Flutter SDK (1.8) / Tomcat Server / IIS Server Browser (IE /Netscape/Mozilla) Windows PowerShell 5.0 or newer, Git 2.x					
		L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Setup the mobile app development environment with necessary tools.
CO 2	Able to design user interface/ Figma of mobile apps.
CO 3	Develop mobile applications using Different layouts.
CO 4	Create graphical, multimedia, gaming and data retrieval applications
CO 5	Test and deploy mobile apps.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	2		2		2	2		1	2	2	2
C02	2	2	2		2		2	2		1	2	2	2
C03	3	3	3		3		2	2		2	3	2	3
C04	3	3	3		3		3	3		3	3	2	3
C05	3	3	3		3		3	3		3	3	2	3

23CAP606	MINI PROJECT				L	T	P	C
					0	0	2	1
COURSE OBJECTIVES:								
<ol style="list-style-type: none"> 1. This course encourages students in developing software which deals with simple problem within the short term of duration. The student acquires skill on learning the problem environment, preparing requirements specification, designing through diagrams, and coding. 2. Individual student project only permitted 3. Students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. 4. Each student shall finally produce a comprehensive report covering background information, problem statement, project work details, and sample coding, result and conclusion. 5. This final report shall be typewritten form as specified in the guidelines. 6. Students are expected to apply the design thinking approach to empathize the problem, define the requirements, ideate design components, prepare software model(prototype) and test the performance 								
					L:0	T:0	P: 15	Total: 15 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Identify the problems to solve by programming technologies
CO 2	Apply theoretical and programming knowledge to formulate, design, program and test the solution

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		3	2		3	3	3	3		3	3	3	3
CO2		3	3		3	3	3	3		3	3	3	3

23CAT701	FULLSTACK DEVELOPMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Relate the responsive web design with advanced JS technologies • Develop database application using MongoDB and React JS Components 							
UNIT I	INTRODUCTION TO CSS and JAVASCRIPT						9
Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST							
UNIT II	SERVER SIDE PROGRAMMING WITH NODE JS						9
Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express							
UNIT III	ADVANCED NODE JS AND DATABASE						9
Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS, MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS							
UNIT IV	ADVANCED CLIENT SIDE PROGRAMMING						9
React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance							
UNIT V	APP IMPLEMENTATION IN CLOUD						9
Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Abraham Silberschatz, Henry F Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, McGraw Hill, 2019.						
T2	R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education/Addison Wesley, 2017						
REFERENCES							
R1	Guy Harrison, “Next Generation Databases, NoSQL, NewSQL and Big Data”, First Edition, Apress publishers, 2015						
R2	Jiawei Han, MichelineKamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, Morgan Kaufmann, 2012.						
R3	Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, First Edition, 2014						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Able to build web content with style sheets using HTML 5
CO 2	Design web application in Express framework to fetch JSON data.
CO 3	Make use of NodeJS component to prepare database operations
CO 4	Understand on how to build user interfaces using React JS libraries
CO 5	Gain knowledge on Cloud fundamentals for application deployment

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2			3		3	3			1	2	2
C02			3		3	2	3		2		2	2	2
C03			3		3	2	3		2		3	3	3
C04			3		3	2	3		2		3	3	3
C05			3		3	2	3		2		3	3	3

23CAT702	MACHINE LEARNING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
1. Understand the learning and linear models for building machine learning based analytical solutions 2. Apply suitable machine learning algorithm using Python modules							
UNIT I	FOUNDATIONS OF LEARNING						9
Components of learning –learning models –geometric models –probabilistic models –logic models –grouping and grading –learning versus design –types of learning –supervised –unsupervised –reinforcement –theory of learning –feasibility of learning–error and noise –training versus testing –theory of generalization –generalization bound –approximation-generalization tradeoff –bias and variance –learning curve							
UNIT II	LINEAR MODELS						9
Linear classification –Univariate linear regression –multivariate linear regression –regularized regression –Logistic regression –perceptrons –multilayer neural networks –learning neural networks structures –support vector machines –soft margin SVM –going beyond linearity –generalization and overfitting –regularization –validation							
UNIT III	DISTANCE-BASED MODELS						9
Nearest neighbor models –K-means –clustering around medoids –silhouettes –hierarchical clustering –k-d trees –locality sensitive hashing–non-parametric regression –ensemble learning –bagging and random forests –boosting –meta learning							
UNIT IV	TREE AND RULE MODELS						9
Decision trees –learning decision trees –ranking and probability estimation trees –regression trees –clustering trees –learning ordered rule lists –learning unordered rule lists –descriptive rule learning –association rule mining –first-order rule learning							
UNIT V	MACHINE LEARNING WITH PYTHON'S SCIKIT LEARN						9
Introduction to scikit-learn library – supervised learning – k nearest neighbors – linear regressions – support vector machines – support vector regression							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, –Learning from Data, AML Book Publishers, 2012.						
T2	P. Flach, –Machine Learning: The art and science of algorithms that make sense of data , Cambridge University Press, 2012.						
REFERENCES							
R1	K. P. Murphy –Machine Learning: A probabilistic perspective , MIT Press, 2012.						
R2	M. Mohri, A. Rostamizadeh, and A. Talwalkar –Foundations of Machine Learning , MIT Press, 2012						
R3	D. Barber –Bayesian Reasoning and Machine Learning , Cambridge University Press, 2012						

COURSE OUTCOMES**At the end of the course students should be able to****CO 1** Able to understand various learning models of Machine Learning.**CO 2** Develop algorithms to learn linear and non-linear models.**CO 3** Apply data clustering algorithms on Analytical Problems.**CO 4** Gain the knowledge on tree and rule-based models.**CO 5** Apply reinforcement learning techniques for real life problems.**Mapping of Programme Outcomes / Programme Specific Outcomes**

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
	C01	2	3	2				2			2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAT703	DIGITAL MARKETING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Recognize and utilize a variety of digital applications to assist management for making marketing decisions. Develop digital marketing recommendations by critically analyzing the internet user behaviour 							
UNIT I	INTRODUCTION TO DIGITAL MARKETING						9
Role of digital marketing (scope & context), Emerging trends, Technology shifts, the online ecosystem. Role of digital marketing in B2B, B2C marketing. The digital consumer - Online consumer definition & types, Audience segmentation and profiling, Consumer online usage and behavior, Emerging trends and patterns in digital consumption, Consumer engagement – meaning and implication.							
UNIT II	USER INTERFACE DESIGN PROCESS						9
Understanding How User Interact With Computers- User Interface Models- Design Methodologies- Designing an Interface- Process of Interaction Design - Human Interaction Speeds, Human Characteristics in Design, Human Consideration in Design.							
UNIT III	SOCIAL MEDIA OPTIMIZATION (SMO)						9
Social Media& e-PR - Online reputation management, Social Media measuring, monitoring & reporting, Tracking & Monitoring platforms. Content seeding, How to use blogs, forums and discussion boards, Blogs, forums and communities, Viral campaigns and the social graph.							
UNIT IV	EMAIL AND MOBILE MARKETING						9
Email Marketing - Principles and best practice, In-house, rental, vendors and 3rd party, Email platforms, Dynamic campaign management tools, Testing & Optimization, Trigger marketing, Contact strategy. Mobile Marketing - The 3rd screen, Landscape & trends, Mobile advertising – WAP & mobile search, Mobile applications and consumer usage behavior, Role of the service provider, publisher & consumer, The Next level of mobile interaction.							
UNIT V	WEB ANALYTICS						9
Introduction - Google Analytics- Navigate Google Analytics – GA reports- Case Study.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Smith P R Chaffey Dave, “E-Marketing Excellence: The Heart of E-Business”, Butterworth Heinemann, USA.						
T2	Deepak Bansal, “A Complete Guide To Search Engine Optimization”, B.R. Publishing Corporation, First edition 2009.						
REFERENCES							
R1	Strauss Judy, “E-Marketing” , Prentice Hall, India						
R2	Grienstein and Feinman, “E-commerce –Security, Risk Management and Control”, TMH, Second Edition, 2011						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Able to understand role of digital media in marketing.
CO 2	Able to use SEO techniques and social media for business success.
CO 3	Optimize the social media as a effective marketing tool.
CO 4	Understand the principles of mobile management and its strategies.
CO 5	Able to apply the web analytics on digital marketing.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2	2		2		3					2	2
C02	2	3	3	3			3	3			2	3	3
C03		3	3	3			3	3			2	3	3
C04	3	3	3			3	3			2	3	3	3
C05		3	3	3			3	3			2	3	3

23CAT704	CYBER SECURITY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ol style="list-style-type: none"> 1. Protecting digital capabilities by understanding vulnerabilities in the digital world. 2. Explore various cyber security threats and provide safeguard using intrusion detection system. 							
UNIT I	INTRODUCTION						9
Introduction to Cybercrime, Classifications of Cyber Crimes, Local and Global perspectives on Cybercrime, Cyber offences, Cyber stalking, Cybercrime and cloud computing, cybercrimes through hand held devices.							
UNIT II	CYBER SECURITY VULNERABILITIES AND CYBER SECURITY SAFEGUARDS						9
Cyber Security Vulnerabilities: Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management .							
UNIT III	SECURING WEB APPLICATION						9
Securing Web Application, Services and Servers Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.							
UNIT IV	INTRUSION PREVENTION AND SECURITY						9
Intrusion Detection and Prevention Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation							
UNIT V	CYBERSPACE AND THE LAW						9
Cyberspace and the Law Introduction: Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and SunitBelpure, Publication WileyIndian Print 2014						
T2	Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication McGraw Hill						
REFERENCES							
R1	Paul A. Watters, Cyber Security: Concepts and Cases, CreateSpace Independent Publishing Platform, 2012						
R2	Peter W. Singer, Allan Friedman, Cybersecurity: What Everyone Needs to Know, Oxford University Press.						

R3	David Sutton, Cyber Security: A Practitioner's Guide, BCS Learning & Development Limited, 2017.
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COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Gain knowledge on basics of cybercrime incidents and how cyber law address them
CO 2	Understanding of the Cyber Security landscape with its growing threats and vulnerabilities
CO 3	Apply access control mechanism and understand how to protect servers
CO 4	Use standard tools and practices to provide innovative and optimal Cyber Security solutions without compromising the privacy needs of individual
CO 5	Familiarizing the fundamentals of cyber space and cyber security policy

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01				1	1	3	2			3	2	2	3
C02				3	2	3	1			2	3	3	3
C03				3	3	2	2			2	3	3	3
C04				3	3	3	2			3	3	3	3
C05				1	2	3	3			2	1	2	3

23CAP701	FULL STACK DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Prepare students to utilize the advanced JS technologies for developing Responsive web design • Make of use of NoSQL database technology for analytical solutions 					
LIST OF PROGRAMS					
<ol style="list-style-type: none"> 1. Implement <ol style="list-style-type: none"> a. Array Types b. String function c. Date function d. User Defined function. 2. Design a User Registration Form for course enrolment and display the information in another page (Use GET/POST). 3. Design user profile collection using PHP and MYSQL. 4. Set Cookies and Retrieve the same in another page. 5. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars. 6. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form. 7. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form. 8. Create a counter using ReactJS. 9. Design a Todo application using ReactJS by storing data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads. 10. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework. <p>Hardware Requirements Intel Pentium IV Processor, Intel Mother Board, 512 MB RAM, 80 GB Hard Disk or above</p> <p>Software Requirements Windows XP Operating System / Linux Operating System Java SDK (1.8) / Tomcat Server / IIS Server, Eclipse Browser (IE /Netscape/Mozilla)</p>					
		L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Able to develop web application with simple functionalities
CO 2	Design an application to transfer the data between pages via sessions
CO 3	Prepare application to handle events using Node JS.
CO 4	Develop server side pages and information retrieval using React JS
CO 5	Create web page application and check login credentials

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	2	2		2		2	2		1	2	2	2
C02	2	2	2		2		2	2		1	2	2	2
C03	3	3	3		3		2	2		2	3	2	3
C04	3	3	3		3		3	3		3	3	2	3
C05	3	3	3		3		3	3		3	3	2	3

23CAP702	DATA ANALYTICS LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Apply machine learning algorithms on data analytical problems using Python • Gain knowledge on availability of data sources and data formats for algorithms 					
LIST OF PROGRAMS					
<ol style="list-style-type: none"> 1. Implement linear regression machine learning algorithm using appropriate dataset 2. Demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 3. Implement k-Nearest Neighbour algorithm to classify the iris data set using Python ML library classes 4. Use diabetes dataset in scikit-learn library and make baseline prediction of disease progression for future patients 5. Logistic Regression using Scikit-Learn 6. Implementation of classifier using Random forest model 7. Perform outlier detection using appropriate dataset 8. Implement multiclass classification using SVM 					
Hardware Requirements					
Intel Pentium IV Processor, Intel Mother Board, 512 MB RAM, 80 GB Hard Disk or above					
Software Requirements					
Windows OS Anaconda Framework					
		L:0	T:0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Ability to understand and implement the concepts of Python programming.
CO 2	Preparing decision tree charting and offering solutions
CO 3	Utilizing the availability of sample data and how to apply them on real problems.
CO 4	Make use of Classifier for building random forest model
CO 5	Provide solutions for classification problem with SVM

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2	2	2		2		2	2		1	2	2	2
C02	2	2	2		2		2	2		1	2	2	2
C03	3	3	3		3		2	2		2	3	2	3
C04	3	3	3		3		3	3		3	3	2	3
C05	3	3	3		3		3	3		3	3	2	3

23CAT705	AUDIT COURSE – RESEARCH METHODOLOGY			L	T	P	C
				2	0	0	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Enable the students to gain knowledge on research problem handling • To use computer assistance tools in research to provide analytical capability 							
UNIT I	RESEARCH DESIGN						9
Literature Review - Identification and Formulation of Research Problem – Types of Research Design; Exploratory, Descriptive and Experimental Research – Formulation of Hypothesis - Sample Design - Types of Data – Data Sources – Methods of Data Collection - Construction of Schedules and Questionnaire – Pilot Study.							
UNIT II	DESCRIPTIVE STATISTICS						9
Processing Data - Editing, Coding and Tabulating Presentation of Data; Diagrammatic and Graphic Representation of Data. Analysis of Data; Mean, Median, Mode Weighted Average and its Merits and Demerits – Dispersion; Range, Standard Deviation, Co-efficient of Variation, Lorenz Curve and Gini Ratio.							
UNIT III	ANALYTICAL STATISTICS						9
Correlation; Simple, Partial and Multiple – Pearson’s Co- efficient of Correlation and Rank Correlation – Regression; Simple, Linear and Non-linear Regression – Multiple Regression; Probit Model and Logit Model - Time Series Analysis; Components and Uses – Methods of Estimating Trend and Seasonal Variations - Testing of Hypotheses; Large and Small Samples - Parametric and Non-Parametric Tests.							
UNIT IV	COMPUTER APPLICATION AND DATA ANALYSIS						9
Data Mining and Processing – Model Building – Software Application in Economic Analysis - Interpretation of SPSS Package Output Relevant for Multivariate Analysis and Logit Model – Estimation of BCR, NPV and IRR.							
UNIT V	REPORT WRITING AND RELATED TECHNIQUES						9
Ethics in Report Writing - Planning of a Research Report – Presenting Literature Review - Stages of Writing Report – Layout of the Research Report – Precaution for Writing Research Reports – Citations - Footnotes – Endnotes – Bibliography – Proof Correction – Finalisation of Thesis - h-index - i10-index - Impact Factor – Citation index of Journals.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Bhandarkar, P.L. & Wilkinson, T.S. (2016). Methodology and Techniques of Social Research. Himalaya Publishing House, Mumbai.						
T2	Elhance, D.N., Elhance V. & Aggarwal, B.M. (2018). Fundamentals of Statistics. KitabMahal, Mumbai. Ferber, R. &Verdoon, P.J. (1962). Research Methods in Economics and Business. Macmillan, New York. Ghosh, B.N. (2015). Scientific Method and Social Research. Sterling Publishers, New Delhi						
REFERENCE BOOKS							
R1	Goode, W.J. &Hatt, P.K. (2022). Methods in Social Research. McGraw Hill, London						

R2	Gujarati, D., Porter, D.C. & Pal, M. (2017). Basic Econometrics. Tata McGraw Hill, New Delhi. Gupta, S.P. (2021). Statistical Methods. S. Chand & Company, New Delhi
R3	Kothari, C.R. & Garg, G. (2019). Research Methodology: Methods and Techniques. New Age International Publishers, New Delhi
R4	Kurien, C.T. (1973). Research Methodology in Economics. Sangam Publishers, Madras
R5	Moser, C.A. & Kolton, C. (1979). Survey Methods in Social Investigation. Heinemann Educational Books, London

COURSE OUTCOMES

At the end of the course students should be able to

CO 1	Able to understand the process of approaching the research problems
CO 2	Apply statistical approaches to process research data
CO 3	Identify the relationship among the properties of data using regression
CO 4	Utilize the statistical software package to process and estimate the data
CO 5	Develop an art of writing report from research outcome

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01				1			1			1			
C02				2			1			1			
C03				3		2	2			1		2	2
C04				3		2	3			3	2	3	3
C05				3		2	3			3	2	3	3

23CAP703	PROJECT WORK				L	T	P	C
					0	0	24	12
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> • The objective of the project work is to enable the students to demonstrate their skills, abilities and specialization. The project work should compulsorily include the software development. • Individual student project only permitted • Students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. • Project periods shall be utilized by the students to receive the directions from the guide, on library reading, laboratory work, and computer analysis and also to present in periodical seminars on the progress made in the project. • The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design and software solution. • The continuous assessment shall be made as per the regulation which is tabulated below. • The progress of the project is evaluated based on a minimum of three reviews. • The review committee may be constituted by the Head of the Department • Each student shall finally produce a comprehensive report covering background information, problem statement, project work details, and sample coding, result and conclusion. • This final report shall be typewritten form as specified in the guidelines. • Each batch should create a video demonstration of their prototype. • Students are expected to apply the design thinking approach to empathize the problem, define the requirements, ideate design components, prepare software model(prototype) and test the performance. 								
					L:0	T:0	P: 24	Total: 180Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Identify the problems to solve by programming technologies
CO 2	Apply theoretical and programming knowledge to formulate, design, program and test the solution

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
CO1		3	2		3	3	3	3		3	3	3	3
CO2		3	3		3	3	3	3		3	3	3	3

23CAE701	HUMAN RESOURCE MANAGEMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand the role of HR manager to promote productivity in business Providing healthy environment to employee to excel in their career 							
UNIT I	FUNDAMENTALS OF HRM						9
Introduction- importance of HRM – functions- qualities of HR manager – evolution and growth of HRM– trends and opportunities - HRM in global environment – legal and ethical context – laws for discriminatory practices – equal opportunity employment.							
UNIT II	STAFFING, RECRUITMENT AND SELECTION						9
HR polices - need, type and scope – human resource planning – job analysis – recruiting goals – recruiting sources – global perspective – selection process – pre-employment testing – interviews – job offers – hiring mistakes - key element for successful predictors.							
UNIT III	TRAINING AND DEVELOPMENT						9
Socialization – new employee orientation, training, development – organizational development – methods – evaluating training –international training and development issues – Talented Professionals – Characterization – Identification – Assessment and Recognizing Talent- Developing Technical Talent –Developing Managerial Talents-Career Counseling.							
UNIT IV	PERFORMANCE EVALUATION, REWARDS AND BENEFITS						9
Appraisal process – methods – factors distort appraisal – team appraisal – international appraisal – rewards – Theories of motivation - compensation administration – job evaluation and pay structure –special cases of compensation – executive compensation programs – employee benefits.							
UNIT V	SAFE AND HEALTHY WORK ENVIRONMENT						9
Occupational safety and health act - issues – stress – assistance program – labor management - employee unions – labor legislation. Promotion, demotion, transfer and separation – employee grievances - redressal methods.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Decenzo and Robbins, “Human Resource Management”,Wilsey, 10th edition, 2012.						
T2	Elhance, D.N., Elhance V. & Aggarwal, B.M. (2018). Fundamentals of Statistics. KitabMahal, Mumbai. Ferber, R. &Verdoon, P.J. (1962). Research Methods in Economics and Business. Macmillan, New York. Ghosh, B.N. (2015). Scientific Method and Social Research. Sterling Publishers, New Delhi						
REFERENCE BOOKS							
R1	Mamoria C.B. and Mamoria. S., “Personnel Management”, Himalaya Publishing Company, 1997.						
R2	Mirza S. Saiyadain, “Human Resource Management” , Tata McGraw Hill, 4th edition 2009.						
R3	EugenceMckenna and Nic Beach, “Human Resource Management”, Pearson Education Limited, 2002.						
R4	Dessler, “Human Resource Management”, Pearson Education Limited, 2002.						
R5	Decenzo and Robbins, Human Resource Management,Wilsey, 6th edition, 2001.						

23CAE702	DATA VISUALIZATION TECHNIQUES			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Provide knowledge to apply suitable visualization methods for data analysis. • Incorporate interaction functionalities in visualization dashboard. 							
UNIT I	INTRODUCTION						9
Context of data visualization – Definition, Methodology, Visualization design objectives. Key Factors – Purpose, visualization function and tone, visualization design options – Visualization-Introduction - Terminology- Basic Charts and Plots- Multivariate Data Visualization- Data Visualization Techniques tools - Hierarchical Visualization Techniques.							
UNIT II	VISUALIZING DATA METHODS						9
Mapping - Time series - Connections and correlations – Indicator-Area chart-Pivot table- Scatter charts, Scatter maps - Tree maps, Space filling and non-space filling methods-Hierarchies and Recursion - Networks and Graphs-Displaying Arbitrary Graphs-node link graph-Matrix representation for graphs- Info graphics.							
UNIT III	DATA VISUALIZATION TOOLS						9
Tableau - Intro to Tableau Interface - Connecting to Data - Visual Analytics – Mapping – Calculations - Dashboard and Stories - Power BI - PowerBI - Visualisation with BI - Data Analysis Expressions.							
UNIT IV	INTERACTIVE DATA VISUALIZATION& SECURITY						9
Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts – Geo-mapping – Exporting, Framework – T3, .js, tablo - Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization - Attacking and defending visualization systems – Creating security visualization system.							
UNIT V	DATA VISUALIZATION TOOLS						9
Rank Analysis Tools- Trend Analysis Tools- Multivariate Analysis Tools- Distribution Analysis Tools- Correlation Analysis Tools- Geographical Analysis Tools - Case study.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Scott Murray, “Interactive data visualizationfor the web”, O“Reilly Media, Inc., 2013.						
T2	Ben Fry, “Visualizing Data”, O“Reilly Media, Inc., 2007.						
T3	Greg Conti, “Security Data Visualization: Graphical Techniques for Network Analysis”,NoStarch Press Inc, 2007						
REFERENCE BOOKS							
R1	Andy Kirk, Data Visualization A Handbook for Data Driven Design, Sage Publications, 2016						
R2	Philipp K. Janert, Gnuplot in Action, Understanding Data with Graphs, Manning Publications, 2010.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Define complex and voluminous data.
CO 2	Apply the various process and tools used for data visualization.
CO 3	Design and use various methodologies present in data visualization.
CO 4	Analyze the process involved and security issues present in data visualization
CO 5	Ability to apply specific statistical and regression analysis methods applicable to predictive

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	3	2				2			2	2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE703	DevOps			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand the architecture and development process of software using DevOps. Learn the way of using maturity model of DevOps for application development. 							
UNIT I	INTRODUCTION						9
Phases of Software Development life cycle. Values and principles of agile software development.							
UNIT II	FUNDAMENTALS OF DEVOPS						9
Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.							
UNIT III	DevOps ADOPTION IN PROJECTS						9
Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes							
UNIT IV	CI/CD						9
Introduction to Continuous Integration, Continuous Delivery and Deployment , Benefits of CI/CD, Metrics to track CICD practices							
UNIT V	Devops MATURITY MODEL						9
Key factors of DevOps maturity model, stages of Devops maturity model, DevOpsmaturity Assessment							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb, 1st Edition, O'Reilly publications, 2016.						
T2	What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012						
REFERENCE BOOKS							
R1	Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.						
R2	The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016						
R3	Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility
CO 2	Describe DevOps & DevSecOps methodologies and their key concepts
CO 3	Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
CO 4	To create a Set up complete private infrastructure using version control systems and CI/CD tools
CO 5	To improve access to development platforms, speed of application development for addressing various issues

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2		2		2		2			2		2	2
C02	2		2		2		2			2		2	2
C03	2		3		3		3			3		2	2
C04	2		3		3		3			3		3	3
C05	2		3		3		3			3		3	3

23CAE704	DATA SCIENCE			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Enable the students to understand data analysis process. • Learn Deep Learning approaches for implementing analysis in MapReduce. 							
UNIT I	INTRODUCTION TO DATA SCIENCE						9
Definition – Big Data and Data Science – Facets of data – big data ecosystem and data science- Data Science Ethics – Doing good data science – Owners of the data – Valuing different aspects of privacy							
UNIT II	DATA SCIENCE PROCESS						9
Overview- research goals – retrieving data – cleaning, integrating and transforming data-exploratory data analysis – build models – present finds							
UNIT III	MACHINE LEARNING						9
Machine learning – Modeling Process – Training model – Validating model – Predicting new observations –Supervised learning algorithms – Unsupervised learning algorithms							
UNIT IV	DEEP LEARNING						9
Introduction – Deep Feedforward Networks – Regularization – Optimization of Deep Learning – Convolutional Networks – Recurrent and Recursive Nets – Applications of Deep Learning							
UNIT V	DATA VISUALIZATION						9
Introduction to data visualization – Data visualization options – Filters – MapReduce – Dashboard development tools – Creating an interactive dashboard with dc.js-dashboard development tools							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali , “Introducing Data Science”, Manning Publications Co., 1st edition, 2016						
REFERENCE BOOKS							
R1	Ian Goodfellow, YoshuaBengio, Aaron Courville , “Deep Learning”, MIT Press, 1st edition, 2016						
R2	Joel Grus, “Data Science from Scratch: First Principles with Python:, O’Reilly, 1st edition, 2015						
R3	Cathy O’Neil, Rachel Schutt , “Doing Data Science, Straight Talk from the Frontline”, O’ Reilly, 1st edition, 2013						
R4	D J Patil, Hilary Mason, Mike Loukides , “Ethics and Data Science”, O’ Reilly, 1st edition, 2018						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Gain knowledge on fundamental concepts of data science
CO 2	Apply data processing techniques on different application domains
CO 3	Demonstrate machine learning algorithms in data science process
CO 4	Infer the concept of deep learning for data analysis
CO 5	Recognize Visualization and present them using various tool

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	3	2				2			2	2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE705	ACCOUNTING AND FINANCIAL MANAGEMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To familiarize the learners with the operations of Financial market and provide insights into basic financial market instruments. To enable the learners to comprehend the fundamentals of the production system, techniques of inventory control and its implementation in business. 							
UNIT I	FINANCIAL ACCOUNTING						9
Meaning and Scope of Accounting - Principles – Concepts – Conventions - Accounting Standards - Final Accounts – Journal - Ledger -Trail Balance -Trading Account - Profit and Loss Account - Balance Sheet.							
UNIT II	ACCOUNTING						9
Accounting Ratio Analysis-definition - objectives - classification of ratios - Funds Flow Analysis - Cash Flow Analysis Meaning – Objectives – Elements of Cost - Cost Sheet - Marginal Costing and Cost Volume Profit Analysis - Break Even Analysis – Applications –Limitations - Standard Costing.							
UNIT III	BUDGETS AND BUDGETING CONTROL						9
Budgets and Budgetary Control-Meaning – Types - Sales Budget - Production Budget - Cost of Production Budget - Flexible Budgeting - Cash Budget - Master Budget - Zero Base Budgeting - Computerized Accounting.							
UNIT IV	INVESTMENT DECISION AND COST OF CAPITAL						9
Objectives and Functions of Financial Management – Risk - Return Relationship - Time Value of Money Concepts - Capital Budgeting - Methods of Appraisal - Cost of Capital- Factors Affecting Cost of Capital - Computation for Each Source of Finance and Weighted Average Cost of Capital.							
UNIT V	FINANCIAL STATEMENT ANALYSIS						9
Introduction - financial statement Analysis – Need- Objectives- Tools - Limitations of Financial Statement Analysis- Common Size - Comparative Statements - Ratio Analysis - Fund flow statement - Cash flow statement – case study.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	S.N.Maheswari, “Financial and Management Accounting”, Sultan Chand & Sons, 2003.						
T2	I.M.Pandey, “Financial Management”, Vikas Publications, 4th Reprint, 2002.						
REFERENCE BOOKS							
R1	S.P.Iyengar, “Cost and Management Accounting”, Sultan Chand & Co,						
R2	I.M.Pandey, “Elements of Management Accounting” Vikas Publishing House, 1993.						
R3	S P Jain & K L Narang, ‘Financial Accounting and Analysis’, Kalyani Publishers, 2009.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Able to gain knowledge on principles of accounting and financial standards.
CO 2	Gain a working knowledge of budget, cost of capital and working capital.
CO 3	Use fund flow and cash flow statement as an analytical tool.
CO 4	Understand the objectives and functions of financial management.
CO 5	Able to understand capital structure and dividend policies.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	2						2	3		2			
C02	2						2	3		2			
C03	2						2	3		2		2	2
C04	2						2	3		2		2	3
C05	2						2	3		2		3	3

23CAE706	BIG DATA ANALYTICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand the Hadoop framework and its components for building Big Data applications Exposure to Dataset and its analytics with R. 							
UNIT I	INTRODUCTION TO BIG DATA						9
Introduction to BigData – Challenges of Conventional Systems - Intelligent data analysis – Data - Analytic Processes and Tools - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - Re-Sampling - Statistical Inference - Prediction Error.							
UNIT II	HADOOP						9
History of Hadoop- The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features							
UNIT III	HADOOP ENVIRONMENT						9
Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation - Hadoop Configuration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud							
UNIT IV	FRAMEWORKS						9
Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications							
UNIT V	R PROGRAMMING						9
Introduction to R: Overview of R; functions and packages in R; working with dataset in R; use R for doing statistical analysis and graphics; R commands . Adoption of R in Industry :Oralce R, Revolution Analytics							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Tom White, “ Hadoop: The Definitive Guide” Third Edition, O’reilly Media, 2012						
T2	A.Ohri, “R for Business Analytics”, Second edition, Springer, 2012						
REFERENCE BOOKS							
R1	Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012						
R2	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012.						
R3	Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.						
R4	PrabhanjanNarayanacharTattar, “R Statistical Application Development						

	byExampleBeginner's Guide”, PACKT, 2013
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Analyze the big data analytic techniques for useful business applications.
CO 2	Design efficient algorithms for mining the data from large volumes
CO 3	Analyze the HADOOP and Map Reduce technologies associated with big data analytics
CO 4	Explore on Big Data applications Using Pig and Hive
CO 5	Apply R programming language on analytical applications

Cos	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	3	2				2			2	2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE707	ETHICS IN INFORMATION TECHNOLOGY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Review and analyze various ethical aspects to regulate content, technology and privacy of internet user Explore the importance of professional and social responsibilities of computing professionals 							
UNIT I	COMPUTER ETHICS AND HACKING						9
A general Introduction – Computer ethics: an overview – Identifying an ethical issue – Ethics and law – Ethical theories - Professional Code of conduct – An ethical dilemma – A framework for ethical decision making - Computer hacking – Destructive programs – hacker ethics - Professional constraints -- Ethical positions on hacking							
UNIT II	ASPECTS OF COMPUTER CRIME AND INTELLECTUAL PROPERTY RIGHTS						9
Aspects of computer crime - Introduction - What is computer crime – computer security measures – Professional duties and obligations - Intellectual Property Rights – The nature of Intellectual property – Intellectual Property – Patents, Trademarks, Trade Secrets, Software Issues, Copyright - The extent and nature of software piracy – Ethical and professional issues – free software and open source code.							
UNIT III	REGULATING INTERNET CONTENT, TECHNOLOGY AND SAFETY						9
Introduction – In defence of freedom expression – censorship – laws upholding free speech – Free speech and the Internet - Ethical and professional issues - Internet technologies and privacy – Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk							
UNIT IV	SOFTWARE DEVELOPMENT AND SOCIAL NETWORKING						9
Software Development – strategies for engineering quality standards – Quality management standards – Social Networking – Company owned social network web site – the use of social networks in the hiring process – Social Networking ethical issues – Cyber bullying – cyber stalking – Online virtual world – Crime in virtual world - digital rights.							
UNIT V	GREEN COMPUTING						9
Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Penny Duquenoy, Simon Jones and Barry G Blundell, “Ethical , legal and professional issues in computing”, Middlesex University Press, 2008 (Unit I, II, III, IV)						
T2	George Reynolds, “Ethics in Information Technology”, Cengage Learning, 2011 (Unit V)						
REFERENCE BOOKS							
R1	BhuvanUnhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011						
R2	Caroline Whitback, “ Ethics in Engineering Practice and Research ”, Cambridge University Press, 2011						
R3	Richard Spinello, “Case Studies in Information and Computer Ethics”, Prentice Hall, 1997.						

R4	John Weckert and Douglas Adeney, "Computer and Information Ethics", Greenwood Press, 1997.
R5	Sara Baase, "A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet", 3rd Edition, Prentice Hall, 2008

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
CO 2	Develop a responsible attitude towards the use of computer as well as the technology.
CO 3	Able to envision the societal impact on the products/ projects they develop in their career.
CO 4	Understand the use of social networking and ethical issues involved in it.
CO 5	Recognize the importance of green computing and environmentally responsible business.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2		2			3				3			
C02	2		2			3				3			
C03	2		2			3				3		3	3
C04	2		2			3				3		3	3
C05	2		2			3				3		3	3

23CAE708	INTERNET OF THINGS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Apply Arduino programming on developing communication among IoT and system Build an inexpensive embedded system using Arduino / Raspberry Pi or equivalent boards 							
UNIT I	FUNDAMENTALS of IoT						9
Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoTvs M2M							
UNIT II	IoT DESIGN METHODOLOGY						9
IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.							
UNIT III	IoT AND ARDUINO PROGRAMMING						9
Introduction to the Concept of IoT Devices – IoT Devices Versus Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino – ArduinoToolchain – Arduino Programming Structure – Sketches – Pins – Input/Output From Pins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.							
UNIT IV	IoT COMMUNICATION AND OPEN PLATFORMS						9
IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth – WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.							
UNIT V	IoT APPLICATIONS FOR INDUSTRY						9
Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	ArshdeepBahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015.						
T2	Michael Miller “The Internet of Things” by Pearson						
T3	Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 1ST Edition, 2016						
T4	Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.						
T5	ArshdeepBahga, Vijay Madiseti, “Internet of Things – A hands-on approach”, Universities Press, 2015.						
REFERENCE BOOKS							
R1	Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Able to design a IoT solution using Arduino/equivalent boards and relevant protocols.
CO 2	Develop web services to access IoT devices using Raspberry Pi Interfaces.
CO 3	Understand the design simple embedded applications.
CO 4	Compare the communication models in IOT
CO 5	To develop IoT infrastructure for popular applications

Mapping of Programme Outcomes / Programme Specific Outcomes

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
	C01	2	2					2				2	3
C02	2	2			3		2				2	3	2
C03	2	2			3		2				2	3	2
C04	2	2			3		2				2	3	2
C05	2	2			3		2				2	3	2

23CAE709	UI/UX DESIGN			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Develop content requirements for UI/UX application by organizing series of approaches Make use of visual design elements and principals to develop effective information design 							
UNIT I	INTRODUCTION						9
UI Design? UX Design Deliverables - Main Ingredients of UX: Psychology, Usability, Design, Copywriting & Analysis							
UNIT II	USER RESEARCH						9
UR methods - User Interviews, Observation, Focus group discussion, Survey Competitor analysis, Empathy mapping							
UNIT III	INTERACTION DESIGN						9
Ideation Methods – Interaction, Wire framing and Prototyping, Paper Prototyping, Build your own Prototyping, Prototyping Tools For UI/UX Designers — How To Choose The Right One? Heuristic (Expert) Evaluation, Designing a Web / Mobile App							
UNIT IV	VISUAL DESIGN						9
Web App UI Elements, Mobile App UI Elements, Grid Systems, Colors Theory and Palette, Understanding Typography – Material UI.							
UNIT V	FUNCTIONAL LAYOUT DESIGN						9
Z-Pattern, F-Pattern, and Visual Hierarchy, Browsing vs. Searching vs. Discovery, Page Framework, The Fold, Images, & Headlines, The Axis of Interaction Forms, Calls-to-Action, Instructions & Labels, Primary & Secondary Buttons.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Donald Norman, “The Design of Everyday Things: Revised and Expanded Edition”, Basic Books, 2013						
T2	Rogers Sharp Peerce,” Interaction Design: Beyond Human Computer Interaction”, 5th Edition, Wiley, 2019						
REFERENCE BOOKS							
R1	Jeff Johnson, “Designing with the mind in mind”, 2nd Edition, Morgan Kaufmann Publication, 2014.						
R2	Alan Dix, Janet Finlay, Gregory Abowd, Russel Beale, “Human–Computer Interaction”, Pearson, 2009.						
R3	Brian Fling, “Mobile Design and Development”, First Edition ,O“Reilly Media Inc., 2009.						
R4	Wilbert O. Galitz, “The Essential Guide to User Interface Design”, Wiley publication, 2002.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Build UI for user Applications
CO 2	Evaluate UX design of any product or application.
CO 3	Demonstrate UX Skills in product development.
CO 4	Able to develop visual designs
CO 5	Create Wireframe and Prototype

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01		2			3		3	3			1	2	2
C02			3		3	2	3		2		2	2	2
C03			3		3	2	3		2		3	3	3
C04			3		3	2	3		2		3	3	3
C05			3		3	2	3		2		3	3	3

23CAE710	DIGITAL FORENSICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ol style="list-style-type: none"> 1. To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices. 2. To understand how to examine digital evidences such as the data acquisition, identification analysis 							
UNIT I	INTRODUCTION						9
The Scope of Computer Forensics - Windows Operating and File Systems –Handling Computer Hardware – Anatomy of Digital Investigation.							
UNIT II	INVESTIGATIVE SMART PRACTICES						9
Forensics Investigative Smart Practices – Time and Forensics – Incident closure Safeguards-Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls.							
UNIT III	LAWS AND PRIVACY CONCERNS						9
Laws Affecting Forensic Investigations – Search Warrants and Subpoenas – Legislated Privacy Concerns – The admissibility of Evidence – First Response and Digital Investigator							
UNIT IV	DATA ACQUISITION AND REPORT WRITING						9
Data Acquisition – Finding Lost Files – Document Analysis – Case Management and Report Writing – Building a Forensics Workstation							
UNIT V	TOOLS AND CASE STUDIES						9
Tools of the Digital Investigator - Licensing and Certification – Case Studies: E-mail Forensics – Web Forensics – Searching the Network – Excavating a Cloud – Mobile device Forensics.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Michael Graves, Digital Archaeology: The Art and Science of Digital Forensics, Addison-Wesley Professional, 2014						
REFERENCE BOOKS							
R1	Darren R. Hayes, Practical Guide to Computer Forensics Investigation, Pearson, 2015.						
R2	Albert J. Marcella and Frederic Guillosoy, Cyber Forensics: From Data to Digital Evidence, Wiley Publishers, 2015.						
R3	Bill Nelson, Amelia Phillips and Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition, Cengage Learning, 2013						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Gain knowledge on computer forensics evidence and legal concerns
CO 2	Know how to perform high tech investigations
CO 3	Know on data acquisition, validation and processing on data
CO 4	Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
CO 5	To be well-trained as next-generation computer crime investigators using latest trends on computer based forensics

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01				1	1	3	2			3	2	2	3
C02				3	2	3	1			2	3	3	3
C03				3	3	2	2			2	3	3	3
C04				3	3	3	2			3	3	3	3
C05				1	2	3	3			2	1	2	3

23CAE711	ARTIFICIAL INTELLIGENCE			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Gain Basic knowledge representation, problem solving, and learning methods of Artificial Intelligence Develop intelligent systems by assembling solutions to concrete computational problems 							
UNIT I	INTRODUCTION						9
Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.							
UNIT II	INVESTIGATIVE SMART PRACTICES						9
Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems -Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games							
UNIT III	LAWS AND PRIVACY CONCERNS						9
Knowledge Representation First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation – Ontological Engineering-Categories and Objects – Events – Mental Events and Mental Objects – Reasoning Systems for Categories -Reasoning with Default Information							
UNIT IV	DATA ACQUISITION AND REPORT WRITING						9
Software Agents Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.							
UNIT V	TOOLS AND CASE STUDIES						9
Applications AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall, Third Edition, 2009.						
T2	Artificial Intelligence: A Modern Approach, 4th Edition, Stuart Russell, peter Norvig University of California at Berkeley, Pearson education, 2020.						
T3	I. Bratko, –Prolog: Programming for Artificial Intelligence, Fourth Edition, Addison-Wesley Educational Publishers Inc., 2011. 142						
REFERENCE BOOKS							
R1	M. Tim Jones, –Artificial Intelligence: A Systems Approach (Computer Science)						
R2	Jones and Bartlett Publishers, Inc.; First Edition, 2008						
R3	Nils J. Nilsson, –The Quest for Artificial Intelligence, Cambridge University Press, 2009.						
R4	William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard, Fifth Edition, Springer, 2003.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Knowledge on problem Solving Approach to apply on typical AI problems
CO 2	Apply appropriate AI techniques to real-world problems to develop intelligent systems.
CO 3	Provide different agents strategy for solving AI problems
CO 4	Develop the functions for software agents by understanding its architecture
CO 5	Design AI based Application using latest trends wide range of techniques

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2	3	2				2			2	2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE712	OPTIMIZATION TECHNIQUES			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understanding the need of optimal solution for business by considering the constraints Model the business problem by suitable linear programming approach 							
UNIT I	LINEAR PROGRAMMING MODELS						9
Mathematical Formulation - Graphical Solution of linear programming models – Simplex method – Artificial variable Techniques- Two Phase Simplex. Integer Programming: Gomory’s IPP method – Gomory’s mixed integer method.							
UNIT II	TRANSPORTATION AND ASSIGNMENT MODELS						9
Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution – optimum solution - degeneracy –Mathematical formulation of assignment models – Hungarian Algorithm – Variants of the Assignment problem							
UNIT III	INVENTORY MODELS						9
Costs involved in inventory-Deterministic inventory models: single item inventory, EOQ with and without shortage having production rate finite and infinite.							
UNIT IV	SCHEDULING BY PERT AND CPM						9
Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling							
UNIT V	QUEUEING MODELS						9
Characteristics of Queuing Models – Poisson Queues - $(M / M / 1) : (FIFO / \infty / \infty)$, $(M / M / 1) : (FIFO / N / \infty)$, $(M / M / C) : (FIFO / \infty / \infty)$, $(M / M / C) : (FIFO / N / \infty)$ models							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Taha H.A., “Operations Research : An Introduction “ 4th Edition, Pearson Education, 2011. .						
T2	A.M.Natarajan, P.Balasubramani, A.Tamilarasi, “Operations Research”, Pearson Education, Asia, 2005.						
REFERENCE BOOKS							
R1	Prem Kumar Gupta, D.S. Hira, “Operations Research”, S.Chand& Company Ltd, New Delhi, 4rd Edition , 2015.						
R2	S.R. Yadav& A.K. Malik, “Operations Research”, First Edtion, Oxford University Press, 2014						
R3	K Sharma., “Operations Research Theory &Applications , 3e”, Macmillan India Ltd, 2007						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Represent problems as linear programming problems and solve it.
CO 2	Apply optimization techniques in transportation and assignment problems
CO 3	Gain knowledge to classify the inventory models and derive solution.
CO 4	Apply PERT and CPM methods in projects and analyze resource requirements
CO 5	Examine and distinguish various queuing models

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3		2					2		1		
CO2	3	3		2					2		1		
CO3	3	3		3					2		1		
CO4	3	3		3					2		1		
CO5	3	3		3					2		1		

23CAE713	BLOCK CHAIN TECHNOLOGY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Impart knowledge about Block chain General Architecture. Optimizing supply chain performance and integrate block chain technologies with supply chains. 							
UNIT I	INTRODUCTION						9
Basics of block chain, Uses of Block chain, Structure of a block, Transactions, Public Ledger, block chain working, accumulation of blocks, pros and cons of block chain, tiers of block chain technology, features of block chain. Types of blockchains							
UNIT II	BLOCK CHAIN ARCHITECTURE						9
Design methodology for block chain applications, block chain application templates, block chain application development, Ethereum, Solidity, Business problems. Decentralized applications-Dapps, implementing Dapps, EthereumDapps, case studies related to Dapps.							
UNIT III	MANAGING INVENTORY IN SUPPLY CHAIN						9
Definition, Concept, Significance and Functions of Operations and SCM. Value in Supply Chain- quality, delivery, flexibility, Source management in Supply Chain- in sourcing, outsourcing, Make VsBuy , Managing Inventory in Supply chain- definition of inventories, Role of Inventory, Inventory control techniques (ABC Analysis, VED Analysis) .							
UNIT IV	BLOCK CHAIN INTEGRATION WITH SUPPLY CHAINS						9
Supply Chain Management & Block chain Integration Overview, Supply Chain Management Traditional Architecture, Supply Chain Management Block chain Architecture, Block chain Deployment Stages, Use case - Food Industry Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyper ledger Fabric							
UNIT V	CASE STUDIES						9
Manufacturing and production, supply chain management, logistics and transportation, Internet of things, e-voting, healthcare, product life cycle, knowledge and innovation management, new business models and applications, Case studies: Decentralized fleet tracking system, supply chain and logistics, Real World Case Study (IBM/Wal-Mart and VeChain)							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Bahga A., MadisetiV.,Blockchain applications: a hands-on approach, VPT, 2017..						
T2	Melanie Swan,“Blockchain: Blueprint for a New Economy”, O“Reilly, 2015.						
REFERENCE BOOKS							
R1	VikramDhillon, David Metcalf and Max Hooper, “Blockchain enabled Applications”, A press, 2017.						
R2	B. Mahadevan, Operations Management Theory & Practice, Pearson, 3rd edition, 2015						

23CAE714	SOCIAL NETWORK ANALYTICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Familiarize the learners with the tools of social network analytics. Learn knowledge representation using Sentiment analysis and implement on social media analytics tools. 							
UNIT I	INTRODUCTION TO SOCIAL MEDIA ANALYTICS						9
Introduction to Social Media Analytics (SMA): Social media landscape, Need for SMA; SMA in Small and large organizations; Application of SMA. Network fundamentals and models: The social networks perspective - nodes, ties and influencers, social network and web data and methods.							
UNIT II	SOCIAL NETWORK ANALYSIS						9
Introduction to Social Network Analysis (SNA): definition and origin, core features of the SNA, Foundation of social network analysis. Networks: nodes, edges, adjacency matrix, one and two-mode networks, node degree, centrality, betweenness, reach, cliques, and paths. Graph Mining: Community detection, Clustering, Community structure, Modularity, Overlapping communities.							
UNIT III	MODELLING						9
Predictive modeling: link/attribute prediction. Influence in Social networks. Sentiment Analysis, Recommendation in Social Networks: Collaborative Filtering, and Content based Recommendation Systems.							
UNIT IV	MINING COMMUNITIES IN SOCIAL NETWORKS						9
Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms.							
UNIT V	VISUALIZATION AND CASE STUDIES						9
Social Networks Visualization, Processing and Visualizing Data, Influence Maximization, Social network analysis case studies: Twitter, Facebook, Last.fm, DBLP, and IMDB, Pilot project.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Gohar F. Khan “Seven Layers of Social Media Analytics:” Mining Business Insights from social media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data- 2015						
T2	Mathew A. Russel “Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites”, Jan 2011-First edition.						
REFERENCE BOOKS							
R1	Tracy L. Tuten, Michael R. Solomon “Social Media Marketing”, SAGE Publications Ltd, 2015.						
R2	Ian McCulloh, Helen Armstrong and Anthony Johnson, “Social Network Analysis with Applications”, Wiley Publications, 2013						
R3	Christina Prell, “Social Network Analysis: History, Theory and Methodology”, 1st Edition, SAGE Publications Ltd, 2012						

COURSE OUTCOMES**At the end of the course students should be able to****CO 1** Predict human behaviour in social web and related communities.**CO 2** Apply statistical models in real time applications.**CO 3** Represent knowledge using Sentiment analysis.**CO 4** Make better business decisions by leveraging social media data.**CO 5** Apply visualisation techniques in social networks.**Mapping of Programme Outcomes / Programme Specific Outcomes**

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
	C01		2	2		2		3					
C02	2	3	3	3			3	3			2	3	3
C03		3	3	3			3	3			2	3	3
C04	3	3	3			3	3			2	3	3	3
C05		3	3	3			3	3			2	3	3

23CAE715	DEEP LEARNING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understanding the different types of deep learning and its architecture Optimizing and generalizing the deep networks 							
UNIT I	MACHINE LEARNING BASICS						9
Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality.							
UNIT II	DEEP LEARNING ARCHITECTURES						9
Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications.							
UNIT III	DEEP NETWORKS						9
History of Deep Learning- A Probabilistic Theory of Deep Learning Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep vs Shallow Networks- Convolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning							
UNIT IV	OPTIMIZATION AND GENERALIZATION						9
Optimization in deep learning- Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience							
UNIT V	VISUALIZATION AND CASE STUDIES						9
Social Networks Visualization, Processing and Visualizing Data, Influence Maximization, Social network analysis case studies: Twitter, Facebook, Last.fm, DBLP, and IMDB, Pilot project.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Gohar F. Khan "Seven Layers of Social Media Analytics:" Mining Business Insights from social media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data- 2015						
T2	Mathew A. Russel "Mining the Social Web: Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites", Jan 2011-First edition.						
REFERENCE BOOKS							
R1	Navin Kumar Manaswi, "Deep Learning with Applications Using Python", Apress, 2018.						
R2	Joshua F. Wiley, "R Deep Learning Essentials", Packt Publications, 2016.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	To understand the theoretical foundations, algorithms and methodologies of Neural Network
CO 2	To introduce dimensionality reduction techniques
CO 3	To design and develop an application using specific deep learning models
CO 4	To enable the students to know deep learning techniques to support real-time applications
CO 5	To provide the practical knowledge in handling and analysing real world applications

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	2				2			2	2	2	2
CO2	2	3	2				2			2	2	2	2
CO3	3	3	3				3			3	3	3	3
CO4	3	3	3		3		3			3	3	3	3
CO5	3	3	3		3		3			3	3	3	3

23CAE716	DATA MINING AND DATA WAREHOUSING TECHNIQUES	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> Analyzing the context of data warehouse and preparing data for analysis Develop an understanding of the role played by knowledge in a diverse range of intelligent systems 					
UNIT I	DATA MINING & DATA PREPROCESSING	9			
Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation.					
UNIT II	ASSOCIATION RULE MINING & CLASSIFICATION Vs PREDICTION	9			
Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Itemsets with and without Candidate Generation - Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.					
UNIT III	CLUSTERING	9			
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint- Based Cluster Analysis – Outlier Analysis.					
UNIT IV	DATA WAREHOUSE	9			
Data Warehousing - Operational Database Systems vs. Data Warehouses - Multidimensional Data Model - Schemas for Multidimensional Databases – OLAP Operations – Data Warehouse Architecture – Indexing – OLAP queries & Tools.					
UNIT V	APPLICATIONS & TOOLS	9			
Data mining in complex data and applications:IIT-Roorkee) Algorithms for mining of spatial data, multimedia data, text data; Data mining applications, social impacts of data mining, trends in data mining. Data Mining Tools: WEKA:Basics of Weka-data file format-Data visualization in WEKA-data filtering- Data Mining with WEKA					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Jiawei Han and MichelineKamber, “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008. (Unit I – V)				
REFERENCE BOOKS					
R1	K.P. Soman, ShyamDiwakar and V. Ajay, “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006. (Unit II & III)				
R2	G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006. (Unit II & IV)				
R3	Berson, Alex & Smith, Stephen J, Data Warehousing, Data Mining, and OLAP, TMH Pub. Co. Ltd, New Delhi, 2012 (Unit I & III)				

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Store voluminous data for online processing and preprocess the data for mining applications.
CO 2	Understand data mining and preprocessing process.
CO 3	Apply the association rules for mining the data and design and deploy appropriate classification techniques.
CO 4	Discover the knowledge imbibed in the high dimensional system and evolve multidimensional intelligent model from typical system.
CO 5	Design and apply classification and clustering techniques on data for better representation.

Mapping of Programme Outcomes / Programme Specific Outcomes

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
	C01	2	3	2				2			2	2	2
C02	2	3	2				2			2	2	2	2
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE717	CLOUD COMPUTING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Understand the technical foundations of cloud systems architectures • Apply principles of best practice in cloud application design and management 							
UNIT I	CLOUD ARCHITECTURE AND MODEL						9
Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture.CloudModels:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.							
UNIT II	VIRTUALIZATION						9
Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.							
UNIT III	CLOUD INFRASTRUCTURE						9
Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.							
UNIT IV	PROGRAMMING MODEL						9
Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.							
UNIT V	SECURITY IN THE CLOUD						9
Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security –Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012						
REFERENCE BOOKS							
R1	Kumar Saurabh, “Cloud Computing – insights into New-Era Infrastructure”, Wiley India,2011.						
R2	Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, TMH, 2009.						
R3	John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2010.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Compare the strengths and limitations of cloud computing.
CO 2	Identify the architecture, infrastructure and delivery models of cloud computing.
CO 3	Apply suitable virtualization concept in clouds
CO 4	Able to understand the various cloud software environments.
CO 5	Recognize the importance of security in the cloud.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2		2		2		2			2		2	2
C02	2		2		2		2			2		2	2
C03	2		3		3		3			3		2	2
C04	2		3		3		3			3		3	3
C05	2		3		3		3			3		3	3

23CAE718	AGILE SOFTWARE DEVELOPMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand the differences between conventional and agile approaches and apply agile principles Gain experience of Agile software development pipeline design and management 							
UNIT I	INTRODUCTION						9
Need of Agile software development, agile context– Manifesto, Principles, Methods, Values, Roles, Artifacts, Stakeholders, and challenges. Business benefits of software agility.							
UNIT II	FUNDAMENTALS OF AGILE SOFTWARE						9
Fundamentals of Agile Process: Introduction and background - Agile Manifesto and Principles - Stakeholders and Challenges - Overview of Agile Development Models: Scrum - Extreme Programming - Feature Driven Development – Crystal – Kanban - and Lean Software Development.							
UNIT III	AGILE PROJECTS PLANNING						9
Recognizing the structure of an agile team– Programmers, Managers, Customers. User stories– Definition, Characteristics and content. Estimation– Planning poker, Prioritizing, and selecting user stories with the customer, projecting team velocity for releases and iterations.							
UNIT IV	AGILE SOFTWARE DESIGN AND DEVELOPMENT						9
Agile design practices, Role of design Principles, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Test Driven Development, Pair programming: Issues and Challenges.							
UNIT V	TESTING PROCESS						9
The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Ken Schawber, Mike Beedle, “Agile Software Development with Scrum”, International Edition, Pearson.						
T2	Robert C. Martin, “Agile Software Development, Principles, Patterns and Practices”, First International Edition, Prentice Hall.						
REFERENCE BOOKS							
R1	Lisa Crispin, Janet Gregory, “Agile Testing: A Practical Guide for Testers and Agile Teams”, International edition, Addison Wesley.						
R2	Alistair Cockburn, “Agile Software Development: The Cooperative Game”, 2nd Edition, Addison-Wesley						
R3	A. Tamilarasi& A.M .Natarajan, “Discrete Mathematics and its Application”, Khanna Publishers, Second Edition, 2005.						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Identify and apply various software diagrams, to determine the quality level of software.
CO 2	Describe the fundamental principles and practices associated with each of the agile development methods.
CO 3	Analyze the core practices behind several specific agile methodologies.
CO 4	Use techniques and skills to establish and mentor Agile Teams for effective software development.
CO 5	Work with various methods, metrics and strategies for Testing software projects.

Mapping of Programme Outcomes / Programme Specific Outcomes

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
	C01	2	3	2				2			2	2	
C02	2	3	2				2			2	2		
C03	3	3	3				3			3	3	3	3
C04	3	3	3		3		3			3	3	3	3
C05	3	3	3		3		3			3	3	3	3

23CAE719	NoSQL DATABASE SYSTEM			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Understand the architectures and common features of the main types of NoSQL databases Equipping learners with a comprehensive understanding of the administrative tasks associated with large-scale MongoDB deployments 							
UNIT I	INTRODUCTION						9
Overview of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points							
UNIT II	COLUMN ORIENTED DATABASE						9
Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key- Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharing, MapReduce on databases.							
UNIT III	INTRODUCTION TO MONGODB						9
Overview of MongoDB - MongoDBvs SQL databases,-MongoDB Data Model: Document and Collections - data types and BSON /JSON format - MongoDB Query languages : CURD Operations- Query operation and expression - MongoDB Management Service(MMS): MMS Overview - Monitoring and Backups with MMS.							
UNIT IV	ADVANCED MONGODB						9
Indexing and Performance Tuning: Overview of Index Types - Index Management and Performance Tuning. - Replication and Sharding : Configuring Replication - Sharding Overview and Use Cases. - Case Study: MongoDB in E-commerce							
UNIT V	APPLICATION OF MONGODB						9
MongoDB in E-commerce - : MongoDB in IoT - MongoDB in Content Management - Technology Case Studies: Google's Search Algorithm- Facebook's Data Management- Netflix's Recommendation Engine. Social Impact : UNICEF's Child Welfare Programs - Greenpeace's Environmental Campaigns.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019						
T2	Guy Harrison, Next Generation Database: NoSQL and big data, Apress, 2016						
REFERENCE BOOKS							
R1	Christopher D.manning, PrabhakarRaghavan, HinrichSchutze, An introduction to Information Retrieval, Cambridge University Press, 2019						
R2	Daniel Abadi, Peter Boncz and Stavros Harizopoulos, The Design and Implementation of Modern Column-Oriented Database Systems, Now Publishers, 2016						
R3	Luc Perkins, Eric Redmond, Jim R. Wilson. Seven Databases in Seven Weeks. The Pragmatic Bookshelf, 2018						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Able to compare different types of NoSQL Databases.
CO 2	Design Schema and implement CRUD operations, distributed data operations.
CO 3	Design and implementation of MongoDB
CO 4	Advanced development of MongoDB
CO 5	Develop Application with Business and social impacts.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	<small>(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)</small>												
	CO-PO Mapping											CO-PSO Mapping	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	1	2				2						1	1
C02	1	2				2						1	1
C03	2	2		2		2	2		2		2	2	2
C04	3	3		2		3	2		2		2	3	3
C05	3	3		2		3	2		2		3	3	3

23CAE720	INFORMATION SECURITY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • Develop an understanding of information assurance practiced in distributed systems, networks and representative applications • Develop a basic understanding of cryptography, how it has evolved and some key encryption techniques used today 							
UNIT I	INTRODUCTION						9
An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks- Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.							
UNIT II	CRYPTOSYSTEMS & AUTHENTICATION						9
Classical Cryptography-Substitution Ciphers-permutation Ciphers-Block Ciphers-DES- Modes of Operation- AES-Linear Cryptanalysis, Differential Cryptanalysis- Hash Function - SHA 512- Message Authentication Codes-HMAC - Authentication Protocols.							
UNIT III	PUBLIC KEY CRYPTOSYSTEMS						9
Introduction to Public key Cryptography- Number theory- The RSA Cryptosystem and Factoring Integer- Attacks on RSA-The ELGamal Cryptosystem- Digital Signature Algorithm-Finite Fields-Elliptic Curves Cryptography- Key management – Session and Interchange keys, Key exchange and generation-PKI.							
UNIT IV	SYSTEM IMPLEMENTATION						9
Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem. Secure Software Development: Secured Coding - OWASP/SANS Top Vulnerabilities – Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls.							
UNIT V	NETWORK SECURITY						9
Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL) - Intruders – HIDS - NIDS - Firewalls – Viruses.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	W. Stallings, Cryptography and Network Security: Principles and Practice, 6th Edition, Prentice Hall, 2013.						
REFERENCE BOOKS							
R1	Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007.						
R2	Jonathan Katz, and Yehuda Lindell, “Introduction to Modern Cryptography”, CRC Press, 2007.						
R3	Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006.						
R4	Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.						
R5	Menezes Bernard, Network Security and Cryptography, Cengage Learning, New Delhi, 2011.						

23CAOE1	SOCIAL MEDIA ANALYTICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Examine the social media landscape and articulate the importance of Social Media Analytics for both small and large organizations, highlighting its diverse applications. Analyze social networks through the concepts of nodes, ties, and influencers, employing graphs and matrices to measure individual and network dynamics and visualize information effectively. 							
UNIT I	INTRODUCTION						9
Social media landscape - Need of Social Media Analytics (SMA) - SMA in Small and large organizations; Application of SMA in different areas. social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization							
UNIT II	MAKING CONNECTIONS						9
Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity.							
UNIT III	WEB ANALYTICS TOOLS						9
Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis							
UNIT IV	FACEBOOK ANALYTICS						9
Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis.							
UNIT V	PROCESSING AND VISUALIZING DATA						9
Processing and Visualizing Data, Influence Maximization, Link Prediction, Collective Classification, Applications in Advertising and Game Analytics Introduction to Python Programming, Collecting and analyzing social media data; visualization and exploration							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Matthew Ganis, Avinash Kohirkar, Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Pearson 2016.						
REFERENCE BOOKS							
R1	Oliver Blanchard, " Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization (Que Biz-Tech)", Que Publishing						
R2	Marshall Sponder "Social Media Analytics" McGraw Hill,						

COURSE OUTCOMES**At the end of the course students should be able to**

CO 1	Understand the Social Media Landscape and the Role of SMA
CO 2	Develop Link Analysis and Network Evolution Insights
CO 3	Employ Web Analytics Tools for SMA
CO 4	Analyze and Measure Facebook Social Media Metrics
CO 5	Process, Visualize, and Explore Social Media Data Using Python

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2						3						
C02													
C03					3		3						
C04		2			3	2	3			2			
C05					3					2			

23CAOE2	WEB CONTENT MANAGEMENT			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> Analyze the key components and functionalities of content management systems and identify scenarios that necessitate their use. Design and implement effective content management systems by gathering requirements, selecting appropriate technologies, and establishing workflows. 							
UNIT I	INTRODUCTION TO CONTENT						9
Introduction -Defining Data, Information, and Content - Content Format - Content Structure - Content Functionality							
UNIT II	CONTENT MANAGEMENT						9
Understanding Content Management - Major Parts of a CMS - The Branches of Content Management - Knowing When You Need a CMS - Component Management versus Composition Management - The Roots of Content Management - The Branches of Content Management							
UNIT III	DESIGNING CONTENT MANAGEMENT SYSTEM						9
Requirement gathering-Doing Logical Design - Selecting Hardware and Software - Implementing the System -The Wheel of Content Management - Working with Metadata - Cataloguing - Designing Publications - Designing Content Types - Content Access - Designing Personalization - Designing Workflow and Staffing Model							
UNIT IV	WORD PRESS						9
Introduction – configuring wordpress- Directory structure- creating and managing content-security							
UNIT V	JOOMLA						9
Introduction – installation and configuration – content type- templates –plugins – security							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Bob Boiko – Content Management Bible, 2nd Edition - Wiley Publishing, Inc., 2005						
T2	Dan Rahmel, “Professional Joomla”,wrox publications, 2011						
REFERENCE BOOKS							
R1	Tris Hussey, “Using wordpress”, Pearson education, 2011						
R2	Eric Tiggeler,” Joomla! 3 Beginner’s Guide”, PACKT Publishing, 2013.						
R3	Sofia Hauschildt,”CMS Made Simple 1.6 Beginners Guide”,– PACKT Publishing, 2010.						
R4	IshaiSagi, “SharePoint 2010 How To”, Pearson Education, SAMS Publication, 2011						
R5	Tris Hussey, “Using wordpress”, Pearson education, 2011						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Know how to organize content of website						
CO 2	Design efficient algorithms for mining the data from large volumes.						
CO 3	Design own content management system with necessary functions						
CO 4	Develop dynamic website with wordpress						
CO 5	Develop and manage websites with Joomla						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes												
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)												
	CO-PO Mapping											CO-PSO Mapping	
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02
C01	2		3		3		3	2		3	2	3	3
C02		3					2					2	2
C03		2					2					2	
C04	2		3		3		3	2		3	2	3	3
C05	2		3		3		3	2		3	2	3	3

23CAOE3	BUSINESS INTELLIGENCE FOR MANAGERS	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> Familiarize the learners with the tools of social network analytics. Learn knowledge representation using Sentiment analysis and implement on social media analytics tools. 						
UNIT I	BUSINESS INTELLIGENCE					9
Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.						
UNIT II	KNOWLEDGE DELIVERY					9
The business intelligence user types - Standard reports - Interactive Analysis and Ad Hoc Querying - Parameterized Reports and Self-Service Reporting - dimensional analysis -Alerts/Notifications - Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards - Geographic Visualization - Integrated Analytics - Considerations: Optimizing the Presentation for the Right Message.						
UNIT III	EFFICIENCY					9
Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices - cross efficiency analysis – virtual inputs and outputs – Other models - Pattern matching – cluster analysis - outlier analysis.						
UNIT IV	BUSINESS INTELLIGENCE APPLICATIONS					9
Marketing models – Logistic and Production models – Case studies.						
UNIT V	FUTURE OF BUSINESS INTELLIGENCE					9
Future of business intelligence – Emerging Technologies - Machine Learning - Predicting the Future - BI Search & Text Analytics – Advanced Visualization – Rich Report - Future beyond Technology.						
		L:45	T:0	P: 0	Total: 45 Periods	
TEXT BOOKS						
T1	Efraim Turban, Ramesh Sharda, DursunDelen, “Decision Support and Business Intelligence Systems”, 9th Edition, Pearson, 2013.					
REFERENCE BOOKS						
R1	Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.					
R2	Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.					
R3	David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Managers Guide”, Second Edition, 2012.					
R4	Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw-Hill, 2007.					
R5	G.K.Gupta, “Introduction to Data Mining with case studies”, Prentice Hall of India, 2011.					

