NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi)
Erode-638 052, Tamilnadu, India, Phone: 04294 – 225585

Curriculum and Syllabus
for
Master of Computer Applications [R17 - Revised]

(This Curriculum and Syllabi are applicable to the Students admitted from the academic year (2020-2021) onwards)

SEPTEMBER 2021

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MCA Department PEOs and POs

PROGRAMME EDUCATIONAL OBJECTIVEs:

PEO1: To excel in fundamentals, problem solving and programming skills in the various computing fields of IT Industries or for to pursue higher studies in the fields of teaching and research.

PEO2: To demonstrate the capabilities in scientific knowledge, logical thinking and fundamental concepts of Computer Application.

PEO3: To develop the ability to plan, analyze, design, code, test, implement & maintain software products for real time system.

PEO4: To experience the students in finding solutions and developing system based applications for real time problems in various domains involving technical, managerial, entrepreneurial, economical & social constraints.

PROGRAMME OUTCOMES:

At the end of a programme a students will be able to demonstrate ability to

a-l	GRADUATE ATTRIBUTEs	PO No.	PROGRAMME OUTCOMEs
a	Multidisciplinary Knowledge	PO1	Understand and Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.
b	Investigative and Analytical Skills	PO2	Identify, Analyze the computing requirements of a problem and solve those using computing principles.
c	Design and Development of Solutions	PO3	Design and Evaluate a computer based system, components and process to meet the specific needs of applications.
d	Lifelong Learning	PO4	Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
e	Managerial and Leadership Skill	PO5	Apply understanding of management principles with computing knowledge to manage projects in multidisciplinary environments.
f	Communication	PO6	Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
g	Ethical, Environmental Concern and Social Responsible, Sustainability	PO7	Understand economical, environmental, social, health, legal, ethical issues within local and global contexts and consequential responsibilities relevant to professional practice.
h	Individual and Team Work	PO8	Function effectively in a team environment to accomplish a common goal.
i	Project Management and Finance	PO9	Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
j	Research and Consultancy	PO10	Use knowledge to analyze, interpret the data and synthesis the information to derive valid conclusions using research methods.
k	Modern Tool Usage	PO11	Ability to use the techniques, skills, and be familiar with modern software tools necessary for Computer Application practice.
l	Proficiency	PO12	Expertise in developing application with required domain knowledge.

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PROGRAMME SPECIFIC OUTCOMES:

PSO1: Ability to understand the principles and working of software aspects in the computer system.

PSO2: Ability to demonstrate knowledge in mathematical models, algorithms and software development methodologies.

PSO3: Ability to develop practical competency in programming languages and open source platforms.

PSO4: Ability to provide a foundation for research and entrepreneurship.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the programme objective and the outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	1	1	1	2	1	3	1	2
2	3	3	3	2	1	2	1	3	3	2	3	3
3	3	3	3	3	3	3	2	3	3	3	3	3
4	3	3	3	2	3	2	2	3	2	3	3	3

MAPPING OF PROGRAM SPECIFIC OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Program Specific Objectives and the outcomes is given in the following table

PROGRAMME SPECIFIC OUTCOMES	PROGRAMME OUTCOMES											
	A	B	C	D	E	F	G	H	I	J	K	L
1	3	3	3	3	1	2	1	1	1	1	1	2
2	3	3	3	2	1	1	1	3	3	2	2	2
3	3	3	3	2	2	3	2	3	3	3	3	3
4	3	3	2	3	3	3	2	3	3	3	3	3

***Contribution** **1: Reasonable** **2: Significant** **3: Strong**

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REGULATIONS – 2017 Revised CHOICE BASED CREDIT SYSTEM

MASTER OF COMPUTER APPLICATIONS

CURRICULA: I – IV SEMESTERS SYLLABI: I – IV SEMESTERS

SEMESTER: I									
SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	17RAA01	Resource Management Techniques and Statistics	FC	NIL	5	3	2	0	4
2	17RAB01	Database Management Systems	PC	NIL	3	3	0	0	3
3	17RAB02	Data Structures using C	PC	NIL	3	3	0	0	3
4	17RAB03	Computer Organization and Operating Systems	PC	NIL	3	3	0	0	3
5	17RAB04	Problem Solving and Programming	PC	NIL	3	3	0	0	3
PRACTICALS									
6	17RAP01	Database Management Systems Laboratory	PC	NIL	4	0	0	4	2
7	17RAP02	Data Structures using C Laboratory	PC	NIL	4	0	0	4	2
8	17RAP03	Problem Solving and Programming Laboratory	PC	NIL	4	0	0	4	2
9	17RAE01	Career Development Skills	EEC	NIL	3	1	0	2	2
				TOTAL	32	16	2	14	24

SEMESTER: II									
SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	17RAB05	Computer Networks	PC	NIL	3	3	0	0	3
2	17RAB06	Software Engineering	PC	NIL	3	3	0	0	3
3	17RAB07	Problem Solving and Algorithmic Skills	PC	17RAB04	3	3	0	0	3
4	E1	Elective – I	PE	NIL	3	3	0	0	3
5	E2	Elective – II	PE/OE	NIL	3	3	0	0	3
PRACTICALS									
6	17RAP04	Software Engineering Laboratory	PC	NIL	4	0	0	4	2
7	17RAP05	Computer Networks Laboratory	PC	NIL	4	0	0	4	2
8	17RAP06	Problem Solving and Algorithmic Skills Laboratory	PC	17RAP03	4	0	0	4	2
				TOTAL	27	15	0	12	21

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SEMESTER: III									
SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
THEORY									
1	17RAB08	Machine Learning	PC	NIL	3	3	0	0	3
2	17RAB09	Web Programming	PC	NIL	3	3	0	0	3
3	E3	Elective – III	PE	NIL	3	3	0	0	3
4	E4	Elective – IV	PE	NIL	3	3	0	0	3
5	E5	Elective – V	PE	NIL	3	3	0	0	3
PRACTICALS									
6	17RAP07	Machine Learning Laboratory	PC	NIL	4	0	0	4	2
7	17RAP08	Web Programming Laboratory	PC	NIL	4	0	0	4	2
8	17RAE02	Mini Project	EEC	NIL	4	0	0	4	2
				TOTAL	27	15	0	12	21

SEMESTER: IV									
SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICALS									
1	E6	Elective – VI	PE	NIL	3	3	0	0	3
2	E7	Elective – VII	PE	NIL	3	3	0	0	3
3	17RAE03	Project Work	EEC	17RAE02	24	0	0	24	12
				TOTAL	30	6	0	24	18

Bridge courses for Non Computer Science students

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
LABORATORY									
1	17RAC01	IT Essentials and PC Installation	BC	NIL	2	2	0	0	0
2	17RAC02	Computer Fundamentals	BC	NIL	2	2	0	0	0
3	17RAC03	Web Design Essentials	BC	NIL	2	2	0	0	0
4	17RAC04	Mathematical Foundations of Computer Science	BC	NIL	2	2	0	0	0

FOUNDATION COURSES (FC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICALS									
1	17RAA01	Resource Management Techniques and Statistics	FC	NIL	3	3	2	0	4

PROFESSIONAL CORE (PC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICALS									
1	17RAB01	Database Management Systems	PC	NIL	3	3	0	0	3
2	17RAB02	Data Structures using C	PC	NIL	3	3	0	0	3
3	17RAB03	Computer Organization and Operating Systems	PC	NIL	3	3	0	0	3
4	17RAB04	Problem Solving and Programming	PC	NIL	3	3	0	0	3
5	17RAB05	Computer Networks	PC	NIL	3	3	0	0	3
6	17RAB06	Software Engineering	PC	NIL	3	3	0	0	3
7	17RAB07	Problem Solving and Algorithmic Skills	PC	17RAB04	3	3	0	0	3
8	17RAB08	Machine Learning	PC	NIL	3	3	0	0	3
9	17RAB09	Web Programming	PC	NIL	3	3	0	0	3
10	17RAP01	Database Management Systems Laboratory	PC	NIL	4	0	0	4	2
11	17RAP02	Data Structures using C Laboratory	PC	NIL	4	0	0	4	2
12	17RAP03	Problem Solving and Programming Laboratory	PC	NIL	4	0	0	4	2
13	17RAP04	Software Engineering Laboratory	PC	NIL	4	0	0	4	2
14	17RAP05	Computer Networks Laboratory	PC	NIL	4	0	0	4	2
15	17RAP06	Problem Solving and Algorithmic Skills Laboratory	PC	17RAP03	4	0	0	4	2
16	17RAP07	Machine Learning Laboratory	PC	NIL	4	0	0	4	2
17	17RAP08	Web Programming Laboratory	PC	NIL	4	0	0	4	2

PROFESSIONAL ELECTIVES (PE)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
1	17RAX01	Object Oriented Programming in Java	PE	NIL	3	3	0	0	3
2	17RAX02	C# and .Net Framework	PE	NIL	3	3	0	0	3
3	17RAX03	Unix and Network Programming	PE	NIL	3	3	0	0	3
4	17RAX04	Ruby on Rails Framework	PE	NIL	3	3	0	0	3
5	17RAX05	XML & Web Services	PE	17RAB09	3	3	0	0	3
6	17RAX06	Mobile Apps Development	PE	NIL	3	3	0	0	3
7	17RAX07	Cloud Suite Business and Syteline Environment	PE	NIL	3	3	0	0	3
8	17RAX08	Internet of Things and its applications	PE	NIL	3	3	0	0	3
9	17RAX09	Big Data Analytics	PE	NIL	3	3	0	0	3
10	17RAX10	Data Mining and Data Warehousing	PE	17RAB01	3	3	0	0	3
11	17RAX11	Cloud Computing	PE	NIL	3	3	0	0	3
12	17RAX12	Business Intelligence	PE	NIL	3	3	0	0	3
13	17RAX13	Organizational Behavior and Entrepreneurship	PE	NIL	3	3	0	0	3
14	17RAX14	Software Testing	PE	17RAB06	3	3	0	0	3
15	17RAX15	Cryptography and Network Security	PE	17RAB05	3	3	0	0	3
16	17RAX16	Mobile Computing	PE	17RAB05	3	3	0	0	3
17	17RAX17	Health Care Management	PE	NIL	3	3	0	0	3
18	17RAX18	Technical Documentation	PE	NIL	3	3	0	0	3
19	17RAX19	Database Administration	PE	17RAB01	3	3	0	0	3
20	17RAX20	Social Network Analysis	PE	NIL	3	3	0	0	3
21	17RAX21	Object Oriented Analysis and Design	PE	NIL	3	3	0	0	3
22	17RAX22	Advanced Database Management Systems	PE	17RAB01	3	3	0	0	3
23	17RAX23	Web Server Administration	PE	NIL	3	3	0	0	3
24	17RAX24	Compiler Design	PE	NIL	3	3	0	0	3
25	17RAX25	Distributed Computing	PE	17RAB05 17RAB03	3	3	0	0	3
26	17RAX26	Professional Ethics	PE	NIL	3	3	0	0	3
27	17RAX27	Software Project Management	PE	NIL	3	3	0	0	3

28	17RAX28	Cyber Security	PE	17RAB05	3	3	0	0	3
29	17RAX29	Image Processing	PE	NIL	3	3	0	0	3
30	17RAX30	Natural Language Processing	PE	NIL	3	3	0	0	3
31	17RAX31	Data Science Techniques	PE	NIL	3	3	0	0	3

OPEN ELECTIVE (OE)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
LABORATORY									
1	17RAO01	Employability Enhancement and Analytical Skills	OE	NIL	3	0	0	6	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	PRE-REQUISITE	CONTACT PERIODS	L	T	P	C
PRACTICALS									
1	17RAE01	Career Development Skills	EEC	NIL	3	1	0	2	2
2	17RAE02	Mini Project	EEC	NIL	4	0	0	4	2
3	17RAE03	Project Work	EEC	17RAE02	24	0	0	24	12

SUMMARY

SL. No.	SUBJECT AREA	CREDITS AS PER SEMESTER				CREDITS TOTAL
		I	II	III	IV	
1	FC	4	0	0	0	04
2	PC	18	15	10	0	43
3	PE	0	6	9	6	21
4	EEC	2	0	2	12	16
CREDITS TOTAL		24	21	21	18	84

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17RAA01 RESOURCE MANAGEMENT TECHNIQUES AND STATISTICS					
		L	T	P	C
		3	2	0	4
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To understand, develop and solve mathematical model of linear programming problems.	1.1	Students will be able to construct and solve linear programming models to answer business optimization problems.	a,b,d,k,l
2.0	To understand, develop and solve mathematical model of Transport and assignment problems.	2.1	Students will be able to apply transportation and assignment models to find optimal solution in warehousing and Travelling.	a,e,l
3.0	To provide knowledge about Game Theory in Computer Applications.	3.1	Students will be able to appraise theoretical predictions obtained from Game Theory analyses against real world conflicts	a,c,d,l
4.0	To understand network modeling for planning and scheduling the project activities.	4.1	Students will be able to prepare project scheduling using PERT and CPM.	a,b,e,l
5.0	To provide knowledge in Statistical Quality Control.	5.1	Students will be able to construct Charts for variables and attributes.	a,b,d,l

UNIT I - LINEAR PROGRAMMING MODELS	(9+3)
Mathematical Formulation-Graphical Solution of linear programming models-Simplex method-Big-M Method-Variants of Simplex method.	
UNIT II - TRANSPORTATION AND ASSIGNMENT MODELS	**(9+3)**
Mathematical formulation of transportation problem- Methods for finding initial basic feasible solution: North West Corner Rule, Least Cost Method, VAM- Optimum solution – degeneracy – Mathematical formulation of assignment models – Hungarian Algorithm – variants of the Assignment problem.	
UNIT III - GAME THEORY	**(9+3)**
Definition-Pay-off-Two person zero -sum games -The maximin-minimax principle-Games without saddle points (Mixed strategies)-2x2 games without saddle points-Graphical method for 2xn or mx2 games-Dominance property.	
UNIT IV - SCHEDULING BY PERT AND CPM	**(9+3)**
Network Construction – Critical Path Method – Project Evaluation and Review Technique – Resource Analysis in Network Scheduling.	
UNIT V - STATISTICAL QUALITY CONTROL, CORRELATION AND REGRESSION	**(9+3)**
Simple Correlation – Regression Lines. SQC: Introduction to Quality Control – Control Charts of Variables (Mean and Range Charts), Control Charts of Attributes (p-Chart, np-Chart, c-Chart).	
	TOTAL (L:45+T:30) = 75 PERIODS

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REFERENCES:

1. Taha, H.A.,"Operations Research: An Introduction", Seventh Edition, Pearson Education, 2004.
2. S. C. Gupta, V. K. Kapoor, "Fundamentals of mathematical Statistics", Eight Edition, Sultan Chand and Sons, New Delhi, 2001.
3. A .M. Natarajan, P. Balasubramani, A.Tamilarasi, "Operations Research" , Pearson Education, Asia, 2005.
4. Prem Kumar Gupta , D.S. Hira "Operations Research", S. Chand & Company Ltd., New Delhi, Third Edition, 2003.
5. V.Sundaresan,K.S.Ganapathy Subramanian, K.Ganesan, "Resource Management Techniques", A.R.Publication. 2002.

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17RAB01 DATABASE MANAGEMENT SYSTEMS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn the different issues involved in the design and implementation of a database system.	1.1	Students will be able to understand database architecture, data models and utilize a wide range of features available in a DBMS package.	b,d,g,h,i	
2.0	Understand database structure, relational algebra, integrity constraints	2.1	Students will be able to use SQL- the standard language of relational databases.	b,c,d,j,k	
3.0	Formulate SQL queries and PL/SQL on data and its syntax.	3.1	Students will be able to use PL/SQL - procedural language extension to Structured Query Language.	b,c,d,j,k	
4.0	Apply normalization techniques to normalize the database.	4.1	Students will be able to understand the functional dependencies and their relationship to keys	j,k,l	
5.0	Understand the techniques for controlling the consequences of concurrent data access.	5.1	Students will be able to understand the concept of Transaction processing and next generation databases.	g,j,k,l	

UNIT I - INTRODUCTION TO DATABASE SYSTEMS	(9)
Introduction to database systems - Definition of DBMS - Advantages of DBMS - Views of data - Levels of data abstraction - Data Models and types - Database architecture - Entity relationship model - ER diagram -EER MODEL.	
UNIT II - RELATIONAL DATA MODEL	**(9)**
Relational database structure - Procedural and Non procedural languages - Relational algebra : operations - Integrity Constraints - SQL Commands : DDL - DML – TCL – Set operations – Join Operations- Aggregation in SQL- Using the group by clause.	
UNIT III - SQL AND PL/SQL	**(10)**
PL/SQL Block - Introduction to PL/SQL - The Advantages of PL/SQL - PL/SQL Architecture - PL/SQL Data types - Variable and Constants - Using Built_in Functions - Conditional and Unconditional Statements -Stored procedures - PROCEDURE with Parameters (IN,OUT and IN OUT) - POSITIONAL Notation and NAMED Notation - Procedure with Cursors - Dropping a Procedure - Functions in PL/SQL : Difference between Procedures and Functions - User Defined Functions - Nested Functions - Using stored function in SQL statements- Trigger - Types of Triggers - Row Level Triggers - Statement Level Triggers - DDL Triggers.	
UNIT IV - DEPENDENCY PRESERVATION AND DB DESIGN	**(8)**
Functional dependency: Full functional Dependency - Partial dependency - Transitive dependency - multi valued dependency - Decomposition - Normalization - Normal Forms : 1NF - 2NF - 3NF - BCNF - 4NF - 5NF.	

UNIT V - TRANSACTIONAL PROCESSING	(9)
Transaction - Properties of transaction - Transaction state - Serialization : types - Need for Serialization - Two Phase Commit - Save Point - Concurrency - Locking protocols - Timestamp protocol– Next Generation Databases: NoSQL, NewSQL and Big Data – Document Databases – Data Models and Storage – NoSQL APIs.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Elmasri.R, S.V. Navathe. "Fundamentals of Database Systems", Sixth Edition, Pearson, New Delhi, 2013.
2. Kevin Loney, Bob Bryla, "Oracle Database DBA Handbook", Tata McGraw Hill Edition, Tata McGraw Hill Publication, 2005.
3. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", 6th Edition, McGraw Hill, 2010.
4. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, New Delhi, 2003.
5. C. J. Date, "An Introduction to Database Systems", 8th Edition, Addison Wesley, 2004.
6. Guy Harrison, "Next Generation Databases", Apress, 2015.

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17RAB02 DATA STRUCTURES USING C

L	T	P	C
3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To learn about various programming constructs.	1.1	Students will be able choose appropriate data types, variables and statements for solving simple problems.	a,b,c,j,l
2.0	To acquire knowledge about array, pointer, structures and unions.	2.1	Students will be able construct programs using arrays and pointers for a given scenario and able generate appropriate structure and union representations for handling compound data.	a,b,c,i,j
3.0	To provide a clear knowledge about different types of data structures and to learn about Linked list.	3.1	Students will be able to understand the behavior of basic data structure and able to implement Linked list.	a,b,c,j,l
4.0	To learn about data structure such as stack and Queue.	4.1	Students will be able to implement stack and Queue Applications.	a,b,c
5.0	To learn to represent data using tree and graph data structure	5.1	Students will be able to implement the tree and search the element in the trees and graph traversal.	a,b,c,j

UNIT I - C PROGRAMMING BASICS (9)

Structure of a C program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in C – Managing Input and Output operations – Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT II – FUNCTIONS, POINTERS, STRUCTURES AND UNIONS (9)

Functions – Pass by value – Pass by reference – Recursion – Pointers – Definition – Initialization – Pointers arithmetic. Structures and unions – definition – Structure within a structure – Union – Programs using structures and Unions – Storage classes, Pre-processor directives.

UNIT III – INTRODUCTION TO DATA STRUCTURES (9)

Data structures: Primitive data structures - Non primitive data structures - Array vs List. Linked List: Introduction - Linked lists - Representation of linked lists in Memory - Traversing a linked list - Searching in linked list - Insertion into linked list - Deletion from a linked list - Types of linked list.

UNIT IV - LINEAR DATA STRUCTURES (9)

Stack ADT – Operations Representation of Stack- Applications – Evaluating Arithmetic Expressions- Conversion of Infix to Postfix Expression – Queue ADT – Operations – Representation of Queue -Circular Queue – Priority Queue – DeQueue – Applications of Queues.

UNIT V - NON-LINEAR DATA STRUCTURES	(9)
Trees – Binary Trees – Binary tree representation and traversals –Binary Search Trees – Applications of trees. Graph and its representations – Graph Traversals– Topological Sort – Bi-connectivity – Euler circuits – Applications of graphs.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison Wesley, Second Edition, 2007
2. Ashok N. Kamthane , " Introduction to Data Structures in C", Pearson Education, Second Edition, 2009.
3. Ellis Horowitz, SartajSahni, Dinesh Mehta, "Fundamentals of Data Structures in C++", Second Edition, University Press, 2010.
4. Puntambekar A.A , " Advanced Data Structures" , First Edition, Technical Publications, 2008

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17RAB03 COMPUTER ORGANIZATION AND OPERATING SYSTEMS				
	L	T	P	C
	3	0	0	3
PREREQUISITE: NIL				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To impart the knowledge about Number systems and various machine instruction of a computer.	1.1	Understand the number system and conversion. Also able to trace the execution sequence of an instruction through the processor.	a,b,c,f,j,k,l
2.0	To learn about CPU organization.	2.1	Acquire knowledge about processor, Instruction sets and ALU.	b,c,f,j,k
3.0	To get an in-depth knowledge about process management	3.1	Understand about Process, semaphores and deadlocks.	b,c,d,l,k
4.0	To learn about memory management.	4.1	Understand about Paging and segmentation	b,c,d,l,k
5.0	To understand about disk scheduling	5.1	Understand about file system and I/O device management.	b,c,d,l,k

UNIT I - NUMBER SYSTEMS AND MACHINE INSTRUCTIONS	(10)
Digital Systems – Binary Numbers – Number Base Conversions – Octal and Hexadecimal Numbers – Complements – Signed Binary Numbers – Binary Codes – Binary Storage and Registers – Binary Logic - Functional units – Basic operational concepts. – Bus structures. Memory Location and Addresses – Memory Operations – Instruction and Instruction Sequencing – Addressing Modes – Assembly Language – Basic Input / Output Operations.	
UNIT II - CPU ORGANIZATION AND DESIGN	**(8)**
Processor basics : CPU Organization – Data Representation – Instruction Sets - Data path design: Fixed point Arithmetic – Arithmetic-Logic units	
UNIT III - PROCESS SYNCHRONIZATION	**(9)**
Operating Systems and services – Processes – CPU Scheduling approaches. Process synchronization – Semaphores – Deadlocks – Handling deadlocks	
UNIT IV - MEMORY MANAGEMENT	**(9)**
Thread – Multithreading. Memory management – Paging – Segmentation – Virtual Memory – Demand paging – Replacement Algorithms.	
UNIT V - DISK SCHEDULING	**(9)**
Disk Scheduling approaches – File systems – Design issues – User interfaces to file systems – I/O device management.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. M.Morris Mano and Michael D. Ciletti , "Digital Design", Prentice Hall Inc., Fourth Edition, 2007. (Unit I)
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Tata McGraw Hill, Fifth Edition, 2002. (Unit II)
3. John P.Hayes, "Computer Architecture and Organization", Third Edition, McGraw Hill,1998. (Unit II)
4. Abraham Silberschatz Peter B. Galvin, G. Gagne, "Operating System Concepts", Eighth Edition, Addison Wesley Publishing Co., 2010.(UNIT III,IV,V)
5. Willam Stalling, "Operating System", Fifth Edition, Pearson Education, 2005.

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17RAB04 PROBLEM SOLVING AND PROGRAMMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		QUESTION PATTERN : TYPE 1			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To gain knowledge about the basics of programming	1.1	The students will be able to understand the basics of Python Programming constructs.	a,c,i
2.0	To gain exposure about selection structure	2.1	The students will be able to design programs involving selection structure	a,b,c
3.0	To get knowledge about repetition structure, function and modules	3.1	The students will be able to design programs involving function, modules and loops.	a,b,c,d,k,l
4.0	To gain exposure about string	4.1	The students will be able to realize the need of strings.	a,b,c,d,k,l
5.0	To get knowledge about mutable and Immutable types	5.1	The students will be able to realize the need of list, tuples and dictionary.	a,b,c,d,k,l

UNIT I - INTRODUCTION TO BASICS OF PROGRAMMING	**(9)**
Basics - Variables and Assignment - Basic Data Types- Comments - Operators - print() – Floats	
UNIT II - SELECTION STRUCTURE	**(9)**
Introduction to Selection Structure - if statements, else statements, nested elif statements, truthy and falsey values, Control Structure	
UNIT III - VALUE – REPETITION AND RETURNING STRUCTURE	**(9)**
Loops - while loops, for loops - Nested Loops - Functions - modules - variable scope.	
UNIT IV - DATA AND STRING PROCESSING	**(9)**
Strings - Accessing the Strings - Traversing the Strings - Working with Strings - Formatting Strings	
UNIT V - MUTABLE AND IMMUTABLE TYPES AND METHODS	**(9)**
Introduction to lists, indexing and slicing of list, del and list methods, Tuples, Dictionary and its methods.	
TOTAL (L: 45) = 45 PERIODS	

REFERENCES:

1. Dr. R. Nageswara Rao, —Core Python Programming, Dreamtech Press, 2017 Edition.
2. Reema Thareja - Problem Solving and Programming – Python, Oxford University Press, 2nd Edition.
3. Wesley J. Chun, —Core Python Programming, Pearson Education, 2nd edition, 2010.

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17RAP01 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	Learn to create and use a database	1.1	Students will be able to design and implement a database schema for a given problem domain.	a,b,c
2.0	Be familiarized with a query language	2.1	Students will be able to query and populate using database.	a,b,c,e,i
3.0	Have a good understanding of DDL, DML Commands and DCL commands.	3.1	Students will be able to create and maintain tables using PL/SQL.	b,c,e,i,k
4.0	Familiarize advanced SQL queries and PL/SQL	4.1	Students will be able to create triggers and functions	b,c,e,i,k
5.0	Be exposed to different applications	5.1	The students will be able to develop the simple project and prepare reports.	c,e,i,k,l

LIST OF EXPERIMENTS

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, Save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
7. Write a PL/SQL block that handles all types of exceptions.
9. Creation of database triggers and functions
10. Mini project (Application Development using Oracle/ Mysql)
    a) Inventory Control System.
    b) Material Requirement Processing.
    c) Hospital Management System.
    d) Railway Reservation System.
    e) Personal Information System.
    f) Web Based User Identification System.
    g) Timetable Management System.
    h) Hotel Management System

TOTAL :(P: 60) = 60 PERIODS

17RAP02 DATA STRUCTURES USING C LABORATORY

L	T	P	C
0	0	4	2

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To learn basic concepts of 'C' language for developing program.	1.1	Students will be able to develop programs using C language.	a,b,c
2.0	To learn to know about arrays.	2.1	Students will be able to write programs using arrays.	a,b,c,l
3.0	To learn to acquire knowledge about functions.	3.1	Students will be able to write programs using function.	a,b,c,l
4.0	To understand linear data structures.	4.1	Students will be able to implement stack and queue.	b,c,k,j,l
5.0	To gain knowledge about non-linear data structures.	5.1	Students will be able to write programs for binary tree and binary search tree operations.	b,c,k,j,l

LIST OF EXPERIMENTS

1. Display the following:
   - (i) Floyd's triangle
   - (ii) Pascal Triangle
2. Generate the following series of numbers:
   - (i) Armstrong numbers between 1 to 100
   - (ii) Prime numbers between 1 to 50
   - (iii) Fibonacci series up to N numbers
3. Manipulate the strings with following operations.
   - (i) Concatenating two strings
   - (ii) Reversing the string
   - (iii) Finding the substring
   - (iv) Replacing a string
   - (v) Finding length of the string
4. Arrays
5. Functions
6. Singly Linked List
7. Circular Linked List
8. Stack
9. Queue
10. Evaluation of Expression
11. Binary Tree Traversal
12. Binary Search Tree Operations

TOTAL :(P: 60) = 60 PERIODS

17RAP03 PROBLEM SOLVING AND PROGRAMMING LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn about usage of operators in Python.	1.1	Students will be able to write simple programs for solving problems.	a,b,c,k,l	
2.0	To understand the concept of control constructs and looping.	2.1	Students will be able to use different decision making statements and looping statements.	a,b,c,k,l	
3.0	To learn about the concepts of functions and modules in Python.	3.1	Students will be able to write, debug and run simple Python programs using functions and modules.	a,b,c,k,l	
4.0	To learn various data structure in Python	4.1	Students will be able to implement different data structures in Python.	b,c,k,j,l	
5.0	To learn about various dictionary operations and methods.	5.1	Students will be able to code to use methods to manipulate dictionaries.	b,c,k,j,l	

LIST OF EXPERIMENTS

1. Program using Operators
2. Program using Conditional Statements
3. Program using Looping Statements
4. Program using Functions
5. Program using Modules
6. Program using Strings
7. Program using List
8. Program using Tuples
9. Program using Dictionary
10. Develop a Simple Project.

TOTAL :(P: 60) = 60 PERIODS

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17RAE01 CAREER DEVELOPMENT SKILLS					
		L	T	P	C
		1	0	2	2
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To recognize and understand the grammatical structures and to improve the students lexical, grammatical and communicative competence.	1.1	Develop communicative proficiency by articulating words and sentences undoubtedly and improve vocabulary and syntax with accuracy and clarity.	d,e,f	
2.0	To train the students to summon words, phrases relevant to the immediate communication tasks.	2.1	Prepare, organize and deliver an engaging oral presentation and articulate their own ideas in relation to other voices and ideas.	e,f,h	
3.0	To prepare students acquire the ability to write effectively in English in real life situations and work related situations.	3.1	Write effectively for a variety of professional and social settings.	d,f,h	

UNIT I – GRAMMAR	(15)
Part of Speech – Verbs – Tenses – Reported Speech – Homophones and Homonyms – Modifiers – Discourse Markers – Prepositional Phrases – Phrasal Verbs – Gerund.	
UNIT II – SPEAKING	**(15)**
Introducing Oneself – Exchanging Personal information (Likes and Dislikes) – Talking about Family & Friends - Asking about Routine Actions and Expressing Opinions - Participating in Short Conversations - Situational Talk. Object Description – Talking about Places – Role Play – Asking for and Giving Directions – Presentation Skills.	
UNIT III – WRITING	**(15)**
Seeking Permission for Industrial Visit - Seeking Permission for In-plant Training – Checklist – Instruction – E-Mail Writing. Inviting Dignitaries – Accepting Invitation – Declining Invitation – Recommendations – Report Writing – Paragraph Writing.	
	TOTAL (L: 15, T:30) = 45 PERIODS

REFERENCES:

1. Sudharshana N.P and Saveetha.C., "English for Technical Communication", Cambridge University Press, New Delhi, 2016.
2. Jackman, Vanessa and Russell Whitehead, "Cambridge English Business Preliminary Practice Tests", New Delhi, Oxford University Press, 2016.
3. Rizvi, Ashraf M., "Effective Technical Communication", Tata McGRaw Hill Publishing Company Limited, New Delhi, 2006.
4. Hewings, M., "Advanced English Grammar", Cambridge University Press, Chennai, 2000.

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17RAB05 COMPUTER NETWORKS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn networking concepts, network architectures and basic communication model.	1.1	Student will be able to identify the data flow in network using protocols, functionality of layers and transmission media.	b,c,e,g,i	
2.0	To understand function and design strategy of data link layer.	2.1	Student will be able to acquire knowledge about methods of error detection and correction, data link layer protocols and services, and various versions of IEEE Project 802.	a,b,c,d,j	
3.0	To understand function and design strategy of network layer.	3.1	Student will be able to acquire knowledge about various switching networks, addressing methods and finding shortest routing algorithms.	a,b,c,j,k	
4.0	To understand function and design strategy of transport layer.	4.1	Student will be able to acquire knowledge about various functionalities of protocols such as TCP, UDP and its usage.	a,b,c,j,k	
5.0	To understand function and design strategy of application layer.	5.1	Student will be able to acquire knowledge about WWW, DNS and various functionalities of protocols such as HTTP, FTP, SMTP and its usage.	b,c,j,k,l	

UNIT I - NETWORK INTRODUCTION & PHYSICAL LAYER	(9)
Components – Data Flow – Networks – Categories of Network - Internet and its standards – Network Topology - Protocol – Protocol Layering - OSI Reference Model - TCP/IP Reference Model – Physical Layer: Transmission Media – Line Coding and its Schemes - Transmission Modes.	
UNIT II - DATA LINK LAYER	**(9)**
Introduction of DLL – Link-Layer Addressing - Error Detection and Correction: Types of Errors, Block Coding - Cyclic Codes – Checksum - Forward Error Correction: Hamming Distance – Data Link Control: DLC Services – Data-Link Layer Protocols - HDLC. Wired LANs: Standard Ethernet - Fast Ethernet - Gigabit Ethernet - Wireless LAN: IEEE 802.11 Project – Bluetooth.	
UNIT III - NETWORK LAYER	**(9)**
Switching – Circuit Switched Networks - Packet Switching – Structure of a Switch – Network Layer Services and Performance – IPV4 Addresses – Routing Algorithms: Distance Vector Routing – Link State Routing – BGP4.	
UNIT IV - TRANSPORT LAYER	**(9)**
Transport Layer Services – Connection Establishment – Flow control – Transmission Control Protocol (TCP) – Congestion Control and Avoidance – User Datagram Protocol (UDP). - Transport for Real Time Applications (RTP).	

UNIT V - APPLICATION LAYER	(9)
World Wide Web and HTTP – FTP – Electronic Mail – TELNET – Secure Shell (SSH) - Domain Name Space (DNS).	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw-Hill, 2013.
2. Andrew S. Tanenbaum, David J. Wetherall "Computer Networks", PHI, Fifth Edition, 2010.
3. William Stallings, "Data and Computer Communication", Tenth Edition, Pearson Education, 2013.
4. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson, 2012.

17RAB06 SOFTWARE ENGINEERING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To become familiar with the various software development life Cycle Models.	1.1	Become competent in recognizing different models, its features and issues.	a,b,d,h,i	
2.0	To get an in-depth knowledge about Requirements to develop a project.	2.1	Understand about Requirements, Prototyping and Techniques.	a,b,g,h,i	
3.0	To learn about Design Concepts.	3.1	Understand about importance of Design.	a,b,c,i,k	
4.0	To learn about different types of Testing.	4.1	Understand about testing and its features.	b,g,h,k,l	
5.0	To learn about SPM Concepts.	5.1	Well-known about various Estimation Methods and Agile Software Management.	b,h,i,k,l	

UNIT I –INTRODUCTION	(9)
Introduction - Software Process-Life Cycle Models: Waterfall - Incremental - Spiral - WINWIN Spiral -Evolutionary - Prototyping - Object Oriented - Fourth Generation Techniques - Agile Process Models-Computer Based System- System Engineering Lifecycle Process-System Engineering Hierarchy.	
UNIT II - SOFTWARE REQUIREMENTS	**(9)**
Functional and Non Functional Requirements - User Requirements - System Requirements - Requirement Engineering Process - Software Prototyping - Prototyping in Software Process - Rapid Prototyping Techniques - User Interface Prototyping.	
UNIT III- ANALYSIS AND DESIGN CONCEPTS	**(9)**
Analysis and Modeling - Data Modeling - Functional Modeling - Behavioral Modeling - Structural Analysis - Design Concepts - Modular Design - Architectural Style - Transform and Transaction Mapping.	
UNIT IV – TESTING	**(9)**
Introduction - Test Activities - Black box Testing - White box Testing - Structural Testing - Unit Testing - Integration Testing - System Testing - Strategic Approach and Issues – Debugging - SRS.	
UNIT V- SOFTWARE PROJECT MANAGEMENT	**(9)**
Measures and Measurement - Software Cost Estimation - Function Point Models - COCOMO Model - Delphi Model - –Agile Software Management – Agile Principles – Scrum, teams, planning and collective commitment.	
TOTAL :(L: 45) = 45 PERIODS	

REFERENCES:

1. Roger S. Pressman, "Software Engineering: A Practitioner Approach", 8th Edition, McGraw-Hill, 2015.
2. Sommerville, "Software Engineering", 10th Edition, Addison Wesley Longman, Pearson Education, 2015.
3. Pankaj Jalote, "A Concise Introduction to Software Engineering", Springer Verlag, 2008.
4. Andrew Stellman, Jennifer Greene, "Learning Agile", O'reilly, 2014.

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17RAB07 PROBLEM SOLVING AND ALGORITHMIC SKILLS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB04	QUESTION PATTERN : TYPE – 1				

COURSE OBJECTIVES AND OUTCOMES

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To impart fundamental concepts of OOP using python	1.1	The students will be able to understand the basics of object oriented concepts in python.	a,b,c
2.0	To gain exposure about inheritance and polymorphism	2.1	The students will be able to develop applications using inheritance and polymorphism	a,b,c,k,l
3.0	To understand the abstract data types and tree data structures	3.1	The students will be able to implement the ADTs and trees	a,b,c,k,l
4.0	To see how graphs and heaps can be used to solve a wide variety of problems	4.1	The students will be able to design graph abstract data type and heap	a,b,c,k,l
5.0	To understand the sorting techniques and shortest path algorithms.	5.1	The students will be able to implement the sorting techniques and shortest path algorithms.	a,b,c,k,l

UNIT I - MOTIVATION OF FUNDAMENTAL CONCEPT IN PROGRAMMING	**(9)**
Implementation of Classes and Objects in Python- Class Attributes and Instance Attributes- 'self ' parameter- Static Methods and Instance Methods- init() method	
UNIT II - ADVANCED FEATURES IN CONCEPT OF PROGRAMMING	**(9)**
Performing Abstraction and Encapsulation in Python- Single Inheritance - Multiple Inheritance - Multilevel Inheritance - Public, Protected and Private - Naming Conventions. Polymorphism- Overriding and the super() method- Diamond Shape Problem in Multiple Inheritance- Overloading an Operator- Implementing an Abstract Base Class (ABC)	
UNIT III - INTRODUCTION TO ALGORITHMIC THINKING AND PEAK FINDING	**(9)**
Array data structure-Linked List Data Structure and Its Implementation - Stacks and Queues - Binary Search Trees - Balanced Trees: AVL Trees and Red-Black Trees	
UNIT IV - MAPPING VALUES AND PRINCIPLE OF OPTIMALITY	**(9)**
Heaps- Heapsort Algorithm - Associative Arrays and Dictionaries - Ternary Search Trees as Associative Arrays - Basic Graph Algorithms - Breadth-First And Depth - First Search - Spanning Trees	
UNIT V-ANALYZING NUMBER OF EXCHANGES IN CRAZY-SORT	**(9)**
Shortest Path Algorithms, Dijkstra'sAlgorithm - Bellman-Ford Algorithm - KruskalAlgorithm - Sorting Algorithms- Bubble Sort, Selection Sort and Insertion Sort - Quicksort and Merge Sort, Non-Comparison Based Sorting Algorithms, Counting Sort and Radix Sort	
TOTAL (L: 45) = 45 PERIODS	

REFERENCES:

1. Dusty Phillips, Python 3 Object-oriented Programming, Packt Publishing, Second Edition.
2. Bradley N. Miller, David L. Ranum,- Problem Solving with Algorithms and Data Structures Using Python, Franklin, Beedle & Associates, 2011.
3. Mark Summerfield - Programming in Python 3, Pearson Education, 2nd Edition.
4. Michael T. Goodrich, Irvine Roberto Tamassia, Michael H. Goldwasser, - Data Structures and Algorithms in Python|| 2013 edition.

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17RAP04 SOFTWARE ENGINEERING LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn how to design the Applications	1.1	Able to design the Front End using GUI.	b,c,i,j,k	
2.0	To learn how to create the Database.	2.1	Able to perform different commands in Back End.	a,c,i,k,l	
3.0	To learn about various connectivity to connect Front and Back End.	3.1	Able to implement connectivity like ADODC, ADO.	a,b,c,i,k	
4.0	To learn about how to develop projects.	4.1	Able to implement code for application projects.	b,c,i,k,l	
5.0	To learn how to test application.	5.1	Able to check and finalize the applications.	b,c,i,k,l	

LIST OF EXPERIMENTS

1. Railway Reservation System
2. Payroll Processing Application
3. Inventory System
4. Banking Operations
5. Library Management System
6. Dictionary
7. Telephone Directory
8. Text Editor

TOTAL :(P: 60) = 60 PERIODS

17RAP05 COMPUTER NETWORKS LABORATORY

L	T	P	C
0	0	4	2

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To identify network components, configuration of IP and network commands.	1.1	Able to identify components used in networking, IP configuration and usage of network commands.	a,b
2.0	To learn how to design network.	2.1	Able to design a network for an organization.	a,b,c
3.0	Learn to develop socket programming	3.1	Able to develop socket programming for communicating client and server programs using TCP and UDP.	a,b,c,l
4.0	To learn about routing and flow control algorithm.	4.1	Able to implement algorithm for routing and flow control of data.	a,b,c,j,l
5.0	To learn about various tools.	5.1	Able to use various tools for packet capturing, analyzing and network simulation.	a,b,k,l

LIST OF EXPERIMENTS

1. Network Layer Concepts (Identification of Network Components, Configuration of IP)
2. Implementation of Network commands.
3. Network Design for an organization.
4. Transport Layer: Datagram (UDP) socket programming.
5. Transport Layer: Stream (TCP) socket Programming.
6. Implementation of Routing and Flow Control algorithms.
7. Application Layer: SMTP and HTTP programming.
8. Experiment on packet capturing and analyzing tools.
9. A study on Network Simulator tools: NS2, NS3, etc.

TOTAL :(P: 60) = 60 PERIODS

17RAP06 PROBLEM SOLVING AND ALGORITHMIC SKILLS LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE: 17RAP03					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To develop skills to design and analyze simple linear and non-linear data structure.	1.1	Students will be able to identify the appropriate data structure for given problem.	a,b,c,k
2.0	To understand the different operations of searching.	2.1	Students will be able to write functions to implement Breadth-First Search and Depth-First Search.	a,b,c,k,l
3.0	To understand different sorting algorithms	3.1	Students will be able to identify appropriate sorting algorithms for the given problem.	a,b,c,k,l
4.0	To understand graph traversal algorithms	4.1	Students will be able to implement basic graph algorithm.	a,b,c,k,l
5.0	To identify suitable data structure and algorithm to solve real world problems.	5.1	Students will be able to choose appropriate data structure to solve various computing problems.	a,b,c,i,j,k,l

LIST OF EXPERIMENTS

1. Implementation of Stack.
2. Implementation of Queue
3. Implementation of Linked Lists
4. Implementation of AVL Tree
5. Implementation of Breadth-First / Depth-First Search
6. Implementation of Quick Sort / Merge Sort
7. Implementation of Bubble Sort / Insertion Sort
8. Implementation of Dijkstra's Algorithm
9. Implementation of Kruskal Algorithm
10. Implementation of Bellman Ford Algorithm
11. Develop the Simple Project

TOTAL :(P: 60) = 60 PERIODS

17RAB08 MACHINE LEARNING				
	L	T	P	C
	3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To understand the basic concepts of machine learning.	1.1	Students will be able to acquire knowledge about the types of machine learning and its functions.	a,b
2.0	To learn about linear algorithms	2.1	Students will be able to acquire knowledge for predicting real values, and classification of problems.	b,c,j
3.0	To learn about non-linear algorithms	3.1	Students will be able to understand various predictive modeling machine learning.	b,c,j
4.0	To know about various model representations such as KNN, LVQ and SVM.	4.1	Students will be able to understand entire training dataset.	b,c,j
5.0	To understand about Hidden Markov Models and explore about machine learning applications.	5.1	Students will be able to use HMM by Speech Recognition and Part-of-Speech Tagging, and Information Extraction. Also know about applications of machine learning.	b,c,j

UNIT I - MACHINE LEARNING AND ITS TECHNIQUES	**(9)**
Machine Learning–Data in Machine Learning - Statistical Learning Perspective - Computer Science Perspective - Models and Algorithms - Learning a Function - Learning a Function to Make Predictions - Techniques for Learning a Function - Parametric and Nonparametric Machine Learning Algorithms - Supervised, Unsupervised and Semi-Supervised Learning - Bias-Variance Trade-Off - Overfitting and Underfitting.	
UNIT II - LINEAR ALGORITHMS	**(9)**
Spreadsheet Math - Gradient Descent - Batch Gradient Descent - Stochastic Gradient Descent - Linear Regression – Learning the Model - Making Predictions with Linear Regression - Logistic Regression – Linear Discriminant Analysis (LDA) - Learning LDA Models - Making Predictions with LDA.	
UNIT III - NON-LINEAR ALGORITHMS	**(9)**
Classification and Regression Trees (CART) - Model Representation – Naive Bayes – Naive Bayes Classifier – Gaussian Naive Bayes – Gaussian Probability Density Function – Make Predictions with Naïve Bayes and Gaussian Naïve Bayes.	
UNIT IV - KNN, LVQ AND SVM	**(9)**
K-Nearest Neighbors (KNN) – KNN Model Representation – Curse of Dimensionality – KNN and Euclidean Distance – Learning Vector Quantization (LVQ) – LVQ Model Representation – Make Predictions with LVQ – Support Vector Machines (SVM) – Maximal-Margin Classifier - Soft Margin Classifier – Kernels - Training SVM With Gradient Descent - Make Predictions with SVM Model.	

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UNIT V - LANGUAGE LEARNING	(9)
Overview of Hidden Markov Models (HMM's) - Overview of Forward-backward EM algorithm for training the parameters of HMM's - Use of HMM's: Speech Recognition, Part-of-Speech Tagging, and Information Extraction - Conditional Random Fields (CRF's) - Probabilistic Context-Free Grammars (PCFG) - Parsing and learning with PCFGs - Lexicalized PCFGs. Applications of Machine Learning: Chatbot, Self driving cars, Automatic Language Translations, Online fraud detection.	
TOTAL (L: 45) = 45 PERIODS	

REFERENCES:

1. Jason Brownlee, "Master Machine Learning Algorithms – Discover How They Work and Implement Them From Scratch", Machine Learning Mastery, Edition v1.1, 2016.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, New York, 2006.
3. Max Kuhn and Kjell Johnson, "Applied Predictive Modeling", Springer, New York, 2013.

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17RAB09 WEB PROGRAMMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To learn the Client and Server side Scripting basics.	1.1	Students will be able to understand how to validate the web page.	b,c,h
2.0	To provide knowledge about Style Sheets.	2.1	Students will be able to create a dynamic page.	a,b,c,h
3.0	To learn the architecture of Servlets	3.1	Students will be able to develop a server side program.	b,c,d,h,i
4.0	To provide knowledge of JSP and Java Beans	4.1	Students will be able to create a Website.	b,c,d,h,i
5.0	To give knowledge about XML and Web Services.	5.1	Students will be able to understand concepts of XML and Web Services.	b,h,i,k,l

UNIT I – SCRIPTING	(9)
Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java Script- Object, names, literals, operators and expressions- statements and features- events - windows - documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML5- HTML 5 canvas - Web site creation using tools.	
UNIT II - CSS3	**(9)**
CSS building blocks- Working with Style sheets- Defining selectors- Formatting text with styles- Layout with styles- Lists- Forms- Video, Audio and Other Multimedia.	
UNIT III – SERVLETS	**(9)**
Java Servlets: Architecture–Overview – Servlet Generating Dynamic Content – Life Cycle -Parameter Data – Sessions - Cookies.	
UNIT IV – JSP	**(9)**
JSP: Overview – Basic JSP: Architecture- Lifecycle– Directives – Actions- Implicit Objects– JavaBeans Classes and JSP – MVC Paradigm.	
UNIT V - XML AND WEB SERVICES	**(9)**
XML – Introduction-Form Navigation-XML Documents- XSL – XSLT- JSON - Web services – UDDI – WSDL - Java Web Services – Web Resources - Web Servers.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Elizabeth Castro, Bruce Hyslop, "HTML5 and CSS3", Pearson Edition, 2012.
2. Jeffrey C.Jackson,"WebTechnologies--A Computer Science Perspective", Pearson Education, 2006.
3. Deitel & Deitel Nieto, "Internet &World Wide Web HowTo Program", 5th Edition, 2012.
4. ThomasA. Powell, "The Complete Reference HTML &CSS",5th Edition, 2010.
5. https://www.tutorialspoint.com/jsp

17RAP07 MACHINE LEARNING LABORATORY

L	T	P	C
0	0	4	2

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To understand about implementation basics of machine learning.	1.1	Students will be able to acquire knowledge about how to develop algorithm by their own.	a,b,c,j,k
2.0	To understand about probability distribution concepts.	2.1	Students will be able to apply probability distribution concepts in dice and coin toss.	a,b,c,j,k
3.0	To code for linear algorithms	3.1	Students will be able to implement for predicting real values, and classification of problems.	a,b,c,j,k
4.0	To code for non-linear algorithms	4.1	Students will be able to implement various predictive modeling machine learning.	a,b,c,j,k,l
5.0	To develop algorithm for various model representations such as KNN, LVQ and SVM.	5.1	Students will be able to implement entire training dataset.	a,b,c,j,k,l

LIST OF EXPERIMENTS

1. Show the probability distribution graph for two throws of a dice.
2. Use the Bernoulli method for Coin toss.
3. Simple Linear Regression with Gradient Descent Algorithm
4. Logistic Regression Algorithm
5. Linear Discriminate Analysis Algorithm
6. Classification and Regression Tree Algorithm
7. Naïve Bayes Algorithm
8. Gaussian Naïve Bayes Algorithm
9. K Nearest Neighbors Algorithm
10. Support Vector Machines Algorithm

TOTAL (P:60) = 60 PERIODS

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17RAP08 WEB PROGRAMMING LABORATORY					
		L	T	P	C
		0	0	4	2
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To get familiar with basics of the Internet Programming.	1.1	Students will be able to implement interactive web page(s) using HTML, CSS and JavaScript.	c,h,j,k,l	
2.0	To acquire knowledge and skills for creation of web site considering both client and server side programming	2.1	Students will be able to design a responsive web site using HTML5 and CSS3	a,c,j,k,l	
3.0	To explore different web extensions and web services standards	3.1	Students will be able to build Dynamic web site using server side Programming and Database connectivity.	b,c,d,j,l	
4.0	To provide knowledge of JSP and Java Beans	4.1	Students will be able to create a Website.	a,c,d,j,l	
5.0	To be well versed with XML and web services Technologies	5.1	Students will be able to build well-formed XML Document and implement Web Service using Java.	a,c,d,j,l	

LIST OF EXPERIMENTS

1. Write a html program for creation of web site with header, nav, section, aside, articles, figure, footer, forms, frames, links, tables, div, etc. tags and CSS.
2. Write a program to drag and drop the div elements into HTML5 canvas.
3. Design a web site using HTML and DHTML. Use Basic text Formatting, Images.
4. Create a script that collects numbers from a page and then adds them up and prints them to a blank field on the page.
5. Create a script that prompts the user for a number and then counts from 1 to that number displaying only the odd numbers.
6. Create a script that will check the field in Assignment 1 for data and alert the user if it is blank. This script should run from a button.
7. Create a registration page using JSP.
8. Create a student report card using XML and XSLT
9. Creating simple application to access data base using JDBC Formatting HTML with CSS.
10. Install Tomcat and create simple application Servlet.
11. Write a program to implement web service for calculator application.
12. Write a program to store and retrieve student marks using Web Services (GET and POST methods).

TOTAL :(P: 60) = 60 PERIODS

17RAE02 MINI PROJECT				
L	T	P	C
0	0	4	2

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To provide the opportunity to the students to demonstrate independence and originality, to plan and organize a large project over a long period.	1.1	Students will be able to identify the problem and analyze the project requirements.	a,b,c
2.0	To carry out the opportunity to specialize in specific areas of Computer Applications.	2.1	Students will be able to apply current techniques and software tools necessary for solving complex modules.	c,d,e
3.0	To provide opportunity to demonstrate a wide range of skills and knowledge learned.	3.1	Students will be able to show their individuality and inspiration in the mini project by designing a specific to real time applications.	e,f,g
4.0	To work effectively in a team environment to accomplish a common goal.	4.1	Students will be able to improve their individuality and work as team player.	g,h,i
5.0	To encourage integration of knowledge gained in the previous course.	5.1	Students will be able to interpret the data and synthesis the information to derive conclusion for implementation of project.	j,k,l

METHODOLOGY	• Maximum four students per batch. • Faculty guide will be allotted for each batch by the HOD. • By mutual discussion, the faculty guide will assign a title in the general /subject area to the student. • Students have to refer the Journals and magazine and collect the published literature. • Using OHP/Power Point, the student has to make presentation for 15 -20 minutes followed by 10 minutes discussion. • Each batch have to do the project and present the progress of the project by two project reviews ,one at the middle and the other near the end of the semester. • The student batches have to write a Technical Report for about 25 -30 pages (Title page, One page Abstract, Review of Research paper under various subheadings, Concluding Remarks and List of References). The technical report has to be submitted to the HOD one week before the final presentation, after the approval of the faculty guide.

<table>
<tr><td rowspan="10">EXECUTION</td><td>Week</td><td>Activity</td></tr>
<tr><td>I</td><td>Allotment of Faculty Guide by the HoD</td></tr>
<tr><td>II</td><td>Collection of Technical papers</td></tr>
<tr><td>III-IV</td><td>Finalizing the title with the approval of Faculty Guide</td></tr>
<tr><td>V</td><td>First Project Review</td></tr>
<tr><td>VI</td><td>Progress of the Project</td></tr>
<tr><td>VII</td><td>Second Project Review</td></tr>
<tr><td>VIII</td><td>Report Preparation</td></tr>
<tr><td>IX</td><td>Report submission</td></tr>
<tr><td>X-XI</td><td>Demo & Final presentation</td></tr>
<tr><td rowspan="6">EVALUATION</td><td colspan="2">50% by Continuous Assessment + 50% by end semester examination
4 Hrs/week and 2 credit</td></tr>
<tr><td colspan="2"><table><tr><td>Component</td><td>Weightage</td></tr><tr><td>First Project Review</td><td>25%</td></tr><tr><td>Second Project Review</td><td>25%</td></tr><tr><td>Project Report</td><td>30%</td></tr><tr><td>Demo & Final presentation</td><td>20%</td></tr><tr><td>Total</td><td>100%</td></tr></table></td></tr>
</table>

TOTAL (P:60) = 60 PERIODS

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17RAE03 PROJECT WORK					
		L	T	P	C
		0	0	24	12
PREREQUISITE: 17RAE02					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To learn to plan, analyze, design and implement software project.	1.1	Students will be able to acquire knowledge by applying various techniques in plan, analyze, design and implement software project.	a,b,c,i,k
2.0	To understand software engineering principles and develop an ability to apply them to software design of real life problems in an industry/commercial environment.	2.1	Students will be able to apply engineering principles such cost estimation and time estimation for project.	a,b,i,k,l
3.0	To learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.	3.1	Students will be able to get motivated to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project.	d,f,g,h
4.0	To learn about communication.	4.1	Students will be able to demonstrate the ability to communicate effectively in speech.	e,f,g
5.0	To learn about professional ethics.	5.1	Students will be able to demonstrate professional ethics while working within team.	e,f,g
6.0	To understand programming language concepts	6.1	Students will be able to apply programming language concepts for the project development.	a,b,c,i,k,l
7.0	To learn about different software development process models and how to choose an appropriate one for a project.		Students will be able to choose from various software development process models appropriate for project.	a,b,c,i,k,l
8.0	To learn about methods of documenting a project.		Students will be able to demonstrate the ability in writing the project details in document.	a,b,c,i,j,k,l

TOTAL (P:24x15)= 360 PERIODS

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PROFESSIONAL ELECTIVES (PE)

17RAX01 OBJECT ORIENTED PROGRAMMING IN JAVA					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn about basic concepts of java	1.1	Students will be able to understand about basics of java.	b,c,h	
2.0	To learn about constructor and classes	2.1	Students will be able to understand about constructor and classes.	a,b,c,h	
3.0	To provide knowledge of files and strings in java	3.1	Students will be able to send and receive data using files.	b,c,d,h,i	
4.0	To provide knowledge of Inheritance and packages	4.1	Students will be able to understand about reusability concepts.	b,c,d,h,i	
5.0	To learn about Exception in java	5.1	Students will be able to understand about how to run the java program without interruption.	b,h,i,k,l	

UNIT I - FUNDAMENTALS OF JAVA PROGRAMMING	(9)
Introduction – Features – Applications – Data types – Key words – Scope – Type casting – Arrays – Operators – Control Statements – Command Line Arguments- Lambda Expressions.	
UNIT II - CLASSES and OBJECTS	**(9)**
Class – Object – Methods – Constructors – Overloading methods and Constructors –using Objects as parameters, returning objects - finalize() – Access Control – keywords: this, static and final – Nested and Inner class.	
UNIT III - I/O STREAMS, STRING AND STRINGBUFFER	**(9)**
I/O Basics: Byte Stream & Character Stream – Reading and Writing Files – String and String Buffer class.	
UNIT IV - ABSTRACTION AND REUSABILITY	**(9)**
Inheritance – super – Method overriding – Dynamic Method Dispatch – Abstract class - final with Inheritance – Interface - Package – Wrapper class.	
UNIT V - EXCEPTION HANDLING	**(9)**
Exception Handling – Thread class – Runnable Interface – Inter Thread Communication – Synchronization.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Herbert Schildt, "The Complete Reference (Fully updated for jdk7)", Oracle Press, Ninth Edition, 2014.
2. Cay S. Horstmann, "Core Java Volume –I Fundamentals", Prentice Hall , 10th Edition, 2015.
3. Deitel & Deitel, "Java How to Program", Prentice Hall, 10th Edition, 2016.
4. Herbert Schildt ,"Java: A Beginner's Guide", Oracle Press, Sixth Edition, 2014.

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17RAX02 C# AND .NET FRAMEWORK					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn programming language C#	1.1	To understand programming concepts in C#	b,c,h	
2.0	To learn about connectivity with ADO.NET	2.1	To understand about connectivity with ADO.NET.	a,b,c,h	
3.0	To learn about Web services	3.1	To understand designing of various form controls.	b,c,d,h,i	
4.0	To design web applications and web services.	4.1	Be able to design web applications and web services.	b,c,d,h,i	
5.0	To provide knowledge in advanced .NET concepts.	5.1	To understand advanced .NET concepts.	b,h,i,k,l	

UNIT I - INTRODUCTION TO C#	(9)
Understanding .NET Framework - Introducing C# - Overview of C# - Literals – Variables - Data Types – Operators – Expressions - Branching – Looping - Methods - Arrays – Strings – Structures – Enumerations – CLR – Garbage Collector.	
UNIT II - OBJECT ORIENTED ASPECTS OF C#	**(9)**
Classes – Constructors & Destructors – Objects – Inheritance – Polymorphism – Interfaces – Access Specifiers - Operator Overloading - Delegates & Events - Errors and Exceptions.	
UNIT III - WINDOWS APPLICATION DEVELOPMENT ON .NET	**(9)**
Introduction to .NET – Windows Applications: Creation - Execution - Window Forms – Common Controls: Menu controls - MDI Forms – ADO.NET: DataReader - DataSets – DataTables - DataViews – SqlConnection – SqlCommand.	
UNIT IV - WEB BASED APPLICATION DEVELOPMENT ON .NET	**(9)**
Overview of ASP.NET – Developing Web Applications using Master and Content pages – Standard, Validation and Data Controls – Authentication and Authorization – AJAX Controls, State Management - ASP.NET Page Life Cycle.	
UNIT V - MORE .NET CONCEPTS	**(9)**
Assemblies – Versioning – Attributes – Reflection – Advance .NET Concepts: MVC -UWP - WPF – WCF – Web API 2.0 – WF.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 3rd edition, 2010.
2. Lalit Arora, Anjali Arora, "C# Using .NET Framework", First Edition, 2010.
3. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
4. Chirag Patel," Advance .NET Technology", Dreamtech Press, 2nd Edition, 2011.

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17RAX03 UNIX AND NETWORK PROGRAMMING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn about basic commands in Unix.	1.1	Students will be able to understand Unix OS environment and gain good understanding of various commands	a,b,k	
2.0	To make understand about Unix file system and information.	2.1	Students will be able to get knowledge about the Unix file System..	a,b	
3.0	To make understand about the Environment and Processes.	3.1	Students will be able to know about creating processes.	c,d,i,j	
4.0	To learn and understand IPC.	4.1	Students will be able to create processes and intercommunication of two processes.	c,d,i,j,l	
5.0	To learn about networking in Unix environment through sockets	5.1	Students will be able to create client / server programs through sockets using TCP, UDP and SCTP protocols.	b,j,k,l	

UNIT I - INTRODUCTION TO UNIX COMMANDS	(9)
Introduction to Unix File System Directory Hierarchy - vi Editor – General Purpose Utilities: cal – date – calendar – who – passwd – echo. Navigating File System: pwd – cd – mkdir – rmdir – ls. File Handling: cat – cp – rm – mv – lp – wc - cmp – comm – diff. Network Commands: telnet – ftp – rlogin – rcp – rsh. Filters: pr – head – tail – cut – paste – sort. Regular Expressions: grep – egrep – fgrep.	
UNIT II - FILE SYSTEM	**(9)**
Overview of UNIX OS - File I/O - Files and Directories – Standard I/O library – System Data Files and Information.	
UNIT III – PROCESSES	**(9)**
Environment of a UNIX process – Process control – Process Relationships – Signals -Threads.	
UNIT IV - INTERPROCESS COMMUNICATION	**(9)**
Introduction - Message passing (XSI) - Pipes – Co-processes - FIFO – Message Queues – Semaphores –Shared Memory.	
UNIT V – SOCKETS	**(9)**
Introduction Socket - TCP Sockets – UDP Sockets – SCTP Sockets – Socket Options - I/O Multiplexing - Name and Address Conversions.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. W.Richard Stevens, Stephen A. Rago, "Advanced Programming in the UNIX Environment", Third Edition, Pearson Education Inc., 2013.
2. W.Richard Stevens, Bill Fenner, Andrew Rudoff, "Unix Network Programming - The Sockets Networking API, Volume 1, Third Edition, Pearson Education, 2014.
3. Sumitabha Das, "Your UNIX/Linux: The Ultimate Guide", Third Edition, Tata-McGraw Hill Education, 2012.
4. Christopher Negus, Christine Bresnahan, "Linux Bible", Eighth Edition, Wiley Publications, 2012.

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17RAX04 RUBY ON RAILS FRAMEWORK					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To understand programming constructs of Ruby.	1.1	Students will be able to write programs and know about Ruby Gem.	b,c,d,k	
2.0	To learn Rails Framework and to use Rails conventions to avoid redundant code.	2.1	Students will be able to develop application in Ruby on Rail.	b,c,d,i,k	
3.0	To learn about model, view and control.	3.1	Students will be able to know how to work with database, implement code and view data.	b,c,d,i,k	
4.0	To deploy Ruby on Rails.	4.1	Students will be able to apply knowledge to deploy Rails.	b,c,i,k,l	
5.0	To learn about advanced concepts in Rails.	5.1	Students will be able to know about prototype, generators, pagination, RESTful rail, etc.,	b,c,i,k,l	

UNIT I PROGRAMMING IN RUBY	(9)
What's Ruby? – Hello Application – Nature of Ruby – Object Oriented Programming – Ruby basics – Classes, Objects and Variables – Built-in Classes and Modules: Scalar Objects – Collections. Control Flow: Conditionals – Loops, Blocks, and Iterators – Exception handling – Advanced Ruby Techniques – Introduction to Ruby Gem – Metaprogramming.	
UNIT II - RAILS FRAMEWORK	**(9)**
What Is Rails?- History of Rails- Installing Rails on Windows, Linux – Setting Development Environment – What is Ruby on Rails – Rails Architecture – Rails Scripts – Creating First Rails Application.	
UNIT III - MODEL, VIEW AND CONTROL	**(9)**
Active Record – Basics – Setting up a Model – Migrations – CRUD Operations – Defining Relationships – implementing Validations – Custom Validations – Advanced Active Record. ActionController – Routing – Creating and using Controllers – Using Filters – Working with Sessions – Caching. ActionView – Embedded Ruby – Layouts – Partials – Helpers – JavaScript, Ajax and RJS - Associations and Callbacks.	
UNIT IV - DEVELOPING RAILS APPLICATION	**(9)**
Developing Book Shelf: Application Overview – Creating a Skeleton – Create Home Page – Implementing Users. Adding Core Functionality: Adding Support – Refactor Sidebar Code – Implementing Search – Implementing Addition and Deletion Operations – Display content. Testing Application: Using Test::Unit – Testing Rails – Test Database – Functional Test – Unit Tests – Integration Tests – Running, Test Coverage and Debugging Techniques.	
UNIT V - ADVANCED CONCEPTS IN RAILS	**(9)**
Prototype : Overview – Extension to JavaScript – OOP with Prototype – Event Handling - Ajax. Script.aculo.us: Overview – Visual Effects – Controls – Drag and Drop – JavaScript Testing. Extending Rails: Generators – Plugins – Writing Plugins – Techniques used to develop plugins – Pagination – exception_notifier – Adding User Authentication. RESTful Rails – Working with Legacy Databases – Using ActionMailer – ActiveResource and XML – Deploying with Capistrano.	
	TOTAL (L: 45) = 45 PERIODS

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REFERENCES:

1. Timothy Fisher, "Ruby on Rails Bible", Wiley India Pvt. Ltd., 2009.
2. Chad Pytel, Tammer Saleh," Rails AntiPatterns: Best Practice Ruby on Rails Refactoring", Addison-Wesley, First Edition, 2010.
3. David A. Black, "The Well-Grounded Rubyist", Manning Publications, Second Edition, 2014.
4. Peter Cooper, "Beginning Ruby: From Novice to Professional", Apress, Third Edition, 2016.

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17RAX05 XML & WEB SERVICES					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB09					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn about XML technology	1.1	To understand programming concepts in XML.	a,b,d	
2.0	To learn about concepts of web services	2.1	To understand about web Services	a,b,d,i,k	
3.0	To learn about implementing XML in E-Business	3.1	To understand about XML in E-Business	c,d,i,j	
4.0	To learn about XML in E-Business	4.1	To understand XML in E-Business	b,c,k,l	
5.0	To learn about XML and content management .	5.1	To understand XML and content management	b,h,i,k,l	

UNIT I - XML TECHNOLOGY FAMILY	(9)
XML – benefits – Advantages of XML over HTML – EDL –Databases – XML based standards – DTD –XML Schemas – X- Files – XML processing – DOM –SAX presentation technologies – XSL – XFORMS – XHTML – voice XML – Transformation – XSLT – XLINK – XPATH –XQ.	
UNIT II - ARCHITECTING WEB SERVICES	**(9)**
Business motivations for web services – B2B – B2C- Technical motivations – limitations of CORBA and DCOM – Service – oriented Architecture (SOA) – Architecting web services – Implementation view – web services technology stack – logical view – composition of web services – deployment view – from application server to peer to peer – process view – life in the runtime.	
UNIT III - WEB SERVICES BUILDING BLOCK	**(9)**
Transport protocols for web services – messaging with web services – protocols – SOAP – describing web services – WSDL – Anatomy of WSDL – manipulating WSDL – web service policy – Discovering web services – UDDI – Anatomy of UDDI- Web service inspection – Ad-Hoc Discovery – Securing web services- Overview of RESTful.	
UNIT IV - IMPLEMENTING XML IN E-BUSINESS	**(9)**
B2B - B2C Applications – Different types of B2B interaction – Components of ebusiness XML systems – ebXML – Rosetta Net Applied XML in vertical industry – Web services for mobile devices.	
UNIT V - XML AND CONTENT MANAGEMENT	**(9)**
Semantic Web – Role of Meta data in web content – Resource Description Framework – RDF schema – Architecture of semantic web – content management workflow – XLANG –WSFL-Marshalling and Unmarshalling.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Ron schmelzer et al, "XML and Web Services", Pearson Education, 2002.
2. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.
3. Frank P. Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002.
4. Keith Ballinger, ".NET Web Services Architecture and Implementation", Pearson Education, 2003.
5. Henry Bequet and Meeraj Kunnumpurath, "Beginning Java Web Services", Apress, 2004.
6. Russ Basiura and Mike Batongbacal, "Professional ASP.NET Web Services", Apress, 2003.

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17RAX06 MOBILE APPS DEVELOPMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To obtain knowledge in Android Platform.	1.1	Students will be able to gain knowledge in various Mobile App developments Environment.	a,b,c,d	
2.0	To understand the fundamentals about the building blocks of Mobile Apps.	2.1	Students will be able to understand about interface designing and SQLite Database.	a,e,f,g	
3.0	To provide knowledge in the role of Multimedia in Mobile Apps.	3.1	Students will be able to extract knowledge in Audio/Video playback and Record during App development.	f,g,h	
4.0	To learn about various types of Testing involved in Mobile Apps.	4.1	Students will be able to apply knowledge in various testing during App development.	i,j,k	
5.0	To obtain knowledge in how to taking Apps to market.	5.1	Students will be able to gain awareness about distributing apps on mobile market place.	i,j,k,l	

UNIT I - GETTING STARTED WITH MOBILITY	(9)
Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development.	
UNIT II - BUILDING BLOCKS OF MOBILE APPS	**(9)**
App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities. App functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs. Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet).	
UNIT III - SPRUCING UP MOBILE APPS	**(9)**
Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope).	
UNIT IV - TESTING MOBILE APPS	**(9)**
Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnit for Android, Robotium, MonkeyTalk.	
UNIT V - TAKING APPS TO MARKET	**(9)**
Versioning, signing and packaging mobile apps, distributing apps on mobile market place. Introduction to Flutter and React Native.	
	TOTAL (L: 45) = 45 PERIODS

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REFERENCES:

1. Anubhav Pradhan, Anil V Deshpande, "Mobile Apps Development", First Edition, 2013.
2. Barry Burd, "Android Application Development All in one for Dummies", First Edition, 2013.
3. "Teach Yourself Android Application Development in 24 Hours", SAMS Publication.

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17RAX07 CLOUD SUITE BUSINESS AND SYTELINE ENVIRONMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To provide knowledge about user interface	1.1	Students will be able to create form view and retrieve data.	a,b,c,k
2.0	To provide knowledge about foundation of business.	2.1	Students will be able to do entries in various business transactions.	a,b,c,k,l
3.0	To provide basics of database administration and personalization.	3.1	Students will be able to customize data in the database.	b,c,k,i,j
4.0	To provide overview of Mongoose environment.	4.1	Students will be able to do data maintenance, data view and data search.	a,b,c,k
5.0	To provide knowledge about report creation in Mongoose environment.	5.1	Students will be able to report configuration and authorization.	b,c,i,k,l

UNIT I - CLOUDSUITE BUSINESS USER INTERFACE	(9)
Introduction: Forms, Records, Fields and Collections – The Explorer- Form View – Form modes – Customizing menu and My Folder –Autorun and PreLoad- Workspace creation – Pin and Unpin – Retrieving data – various operations on records –Notes.	
UNIT II - CLOUDSUITE BUSINESS FOUNDATION	**(9)**
Financials, Customers, Items and Vendors – Customer order - Purchase order requisition – Purchase Order – Shipping – Invoice – Accounts Receivable- Accounts Payable –Vouchers – Journal Entries – General Ledger – Reviewing financials.	
UNIT III - ADMINISTRATION AND SYTELINE FORM PERSONALIZATION	**(9)**
Framework – Database- Taskman service – background task – Audit trails – Utilities – System data architecture – Customizing form components – inherited attributes –list sources –validators – Strings customization –User Extended tables (USTs) – Event Handlers.	
UNIT IV - EXTENDING WITH MONGOOSE AND WORKBENCH	**(9)**
System development environment – design mode – Cost Centers data Maintenance – Employee data maintenance – Expense Report – IDO – Workbench – Data Views – Data Search – Critical Numbers – Data View Actions.	
UNIT V - SSRS AND MONGOOSE APPLICATION FOUNDATION	**(9)**
SQL Server Reporting Services (SSRS) overview – BIDS - Syteline Configuration for reports – Report Authorization – Report Server administration – Mongoose Topology – Licensing – Runtime Basics – Access As Identifier – Runtime UI – Derived property classes – Query forms – Sub collections – Issues data maintenance – Global objects – Issues form.	
	TOTAL (L: 45) = 45 PERIODS

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REFERENCE:

1. InforCloudSuite Business / Syteline v9 Foundation 101.

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17RAX08 INTERNET OF THINGS AND ITS APPLICATIONS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To make the students to know about basics of Electrical and Electronic devices.	1.1	Students will be able to understand basics of Electrical circuits and Electronic devices	a,c,d,i	
2.0	To make the students to know about basics and block diagram of IoT.	2.1	Students will be able to understand IOT characteristics and its essential components.	a,b,d,e	
3.0	To make the students to know about Arduino processor and working of Analog and Digital I/O pins.	3.1	Students will be able to describe Arduino processor and working of Analog and Digital I/O pins.	a,b,c,g	
4.0	To make the students to know about Raspberry pi and its interface with other devices.	4.1	Students will be able to understand Raspberry pi and its interface with other devices.	a,b,c,j	
5.0	To motivate the students to implement the IoT using Arduino/ Raspberry Pi.	5.1	Students will be able to implement a IoT system using Arduino/Raspberry Pi.	a,f,k,l	

UNIT I - BASIC ELECTRICAL CIRCUITS AND ELECTRONICS	(9)
Introduction - Current, voltage and resistance - Analog and Digital Signal - conductors Vs Insulators – KCL- KVL - Basic Electronics components - calculating equivalent resistance for series and parallel circuits- Ohm's law- Color coding for a resistor – LED – LCD - LDR.	
UNIT II - INTRODUCTION TO INTERNET OF THINGS	**(9)**
Introduction - Definition and characteristics of Internet of Things - General Block Diagram and essential components of IOT - Role of microprocessor & Micro controller- communication of things - IOT connection with internet.	
UNIT III- PROGRAMMING USING ARDUINO	**(9)**
Introduction to Arduino processor- General Block diagram- Working of Analog and Digital I/O pins- Serial (UART) , I2C Communications and SPI communication - Arduino Boards: Mega, Due, Zero and 101 - Prototyping basics - Technical description - Setting Up Arduino IDE- Introduction to Arduino programming.	
UNIT IV - PROGRAMMING USING RASPBERRY PI	**(9)**
Technical Description of Raspberry Pi - comparison of Raspberry Pi Vs Arduino - Operating Systems for RPi - Preparing SD Card for Pi - Connecting Raspberry Pi as PC - Exploring Raspberry Pi Environment- Logical design using Python.	
UNIT V- APPLICATIONS OF IOT	**(9)**
Various Real time applications of IoT- automation - Smart Parking - Environment: Weather monitoring system - Agriculture: Smart irrigation – Domain Specific applications.	
	TOTAL (L: 45) = 45 PERIODS

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1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.
2. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering",Tata McGraw Hill, Second Edition, (2006).
3. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2nd edition, 2013.
4. Marco Schwartz, – Internet of Things with the Arduino Yun, Packt Publishing, 2014.
5. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley Publications, 2012.

17RAX09 BIG DATA ANALYTICS				
L	T	P	C
3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To learn tips and tricks for Big Data use cases and solutions.	1.1	Students will get knowledge about the basic terminology of Big Data Analytics.	a,b,c
2.0	To understand the life cycle of Data Analytics.	2.1	Students will get knowledge about how data will discover, prepare, plan and build model in data analytics.	b,c,d
3.0	To understand data analysis methods.	3.1	Students will get knowledge of Data mining tool and practical experience of applying data mining algorithms.	a,b,c,d
4.0	Understand the basics of R programming including vectors, list, etc.	4.1	Students will be able to recognize and make appropriate use of different types of data structures.	a,c,j,k,l
5.0	Become proficient in writing a fundamental program and perform analytics with R	5.1	Students will be able to design and write functions in R and to create sophisticated figures and graphs.	a,c,j,k,l

UNIT I – INTRODUCTION	**(8)**
Introduction – Characteristics and Considerations – Data Structures – Business drivers – Business intelligence Vs Data science – Analytical Architecture –Key Roles of the New Big Data Ecosystem – Data Scientist - Big Data Applications.	
UNIT II - DATA ANALYTICS LIFECYCLE	**(8)**
Data Analytics Lifecycle: Discovery-Data preparation – Model Planning – Model Building – Communicate results – Operationalize - Key Roles for a Successful Analytic Project - Case Studies.	
UNIT III - ADVANCED ANALYTICS THEORY AND METHODS	**(10)**
Association Rules: Apriori Algorithm - Evaluation of Candidate Rules -Applications of Association Rules - Regression: Linear Regression – Logistic Regression. Introduction of Hadoop and Map Reduce.	
UNIT IV - R PROGRAMMING: INTRODUCTION	**(10)**
Overview – Environment Setup – Data Types – Variables – Operators – Decision Making – Loops Statements – Function – Strings – Vectors: Scalars, Recycling, Operations – Function: All and Any, Vectorized operations, NA and NULL values, Filtering , Vectorized if-then else, Vector Equality, Vector Element names. Lists: Creation, Operations – Accessing List Components and Values, Applying functions to lists, Recursive List. Matrices: Creation, Operations – Applying functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction-Avoiding Dimension Reduction, Higher Dimensional arrays.	
UNIT V - ARRAYS,DATA FRAMES,INTERFACING AND GRAPHICS	**(9)**
Arrays: Creating, Accessing, Manipulating Array Elements – Factors: Factors and Tables, Factors and Levels, Functions, Working with tables. Data Frames: Creation, Matrix-like Operations, and Merging Data frames – Applying functions to Data Frames. R Data Interfaces: CSV Files – Excel files – Databases. Graphics: Creating Graphs, Customizing Graphs, Saving graphs to files, Creating three-dimensional plots. Charts: Pie chart – Bar Chart – Box plots – Histograms – Line Graphs – Scatter plots.	
TOTAL (L: 45) = 45 PERIODS	

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REFERENCES:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", John Wiley & Sons Publications.
2. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
3. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
4. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012.

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17RAX10 DATA MINING AND DATA WAREHOUSING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB01					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To impart knowledge in Data Mining.	1.1	Students will be able to understand various types of data that can be mined.	a,b,c	
2.0	To understand the various Data Preprocessing in Data Mining.	2.1	Students will be able to gain awareness about the importance of data cleaning.	d,e,f	
3.0	To provide knowledge in classification methods and clustering.	3.1	Students will be able to know about various classification methods and the Evaluation of clustering.	d,f,g	
4.0	To understand about various pattern mining.	4.1	Students will be able to apply a various patterns in data mining.	h.i,j	
5.0	To provide knowledge Data Warehousing.	5.1	Students will be able to acquire knowledge about various data warehousing design and its usage.	j,k,l	

UNIT I - INTRODUCTION TO DATA MINING	(9)
Data Mining Definition - Why Data Mining - Types of Data can be Mined – Patterns – Technologies - Applications-Issues in Data Mining - Data Objects and Attribute Types - Basic Statistical Descriptions of Data - Data Visualization - Measuring Data Similarity and Dissimilarity - Case Study.	
UNIT II - DATA PREPROCESSING	**(9)**
Data Preprocessing: An Overview - Data Cleaning - Data Integration - Data Reduction - Data Transformation and Data Discretization.	
UNIT III - CLASSIFICATION AND CLUSTERING	**(9)**
Classification: Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification– Model Evaluation and Selection. Clustering: Analysis – Partitioning, Hierarchical, Density Based Methods and Grid Based Methods – Evaluation of Clustering.	
UNIT IV - PATTERN MINING	**(9)**
Pattern Mining in Multilevel, Multidimensional Space-Constraint: Based Frequent Pattern Mining-Mining High Dimensional Data and Colossal Patterns-Mining Compressed Patterns-Pattern Exploration and Application.	
UNIT V - DATA WAREHOUSING	**(9)**
Data Warehouse: Basic Concepts - Data Warehouse Modeling Data Cube and OLAP - Data Warehouse Design and Usage – Implementation - Data Generalization- Case Study.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann Publishers, 2012.
2. George M. Marakas, "Modern Data Warehousing, Mining and Visualization: Core Concepts", Spring, 2012.

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17RAX11 CLOUD COMPUTING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To introduce the broad perceptive of cloud architecture and model.	1.1	Students will be able to identify the architecture, infrastructure and delivery models of cloud computing.	a,b,c,g	
2.0	To understand the concept of developing of cloud Services.	2.1	Students will be able to choose the appropriate cloud player, Programming Models and approach.	a,b,c,i,j	
3.0	To be familiar with the lead players in cloud.	3.1	Students will be able to compare the strengths and limitations of cloud computing.	b,d,e	
4.0	To know different cloud programming models as per need.	4.1	Students will be able to design Cloud Services and Set a private cloud.	b,c,k,l	
5.0	To provide knowledge on Cloud Storage and Sharing.	5.1	Students will be able to evaluate File Storage and Explore Sharing.	b,c,k,g	

UNIT I - UNDERSTANDING CLOUD COMPUTING	(7)
Cloud Computing – History of Cloud Computing - Cloud Architecture – Cloud Storage – Need for Cloud Computing - Advantages and Disadvantages of Cloud Computing - Companies in the Cloud Today – Cloud Services.	
UNIT II - DEVELOPING CLOUD SERVICES	**(10)**
Web–Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds.	
UNIT III - USING CLOUD SERVICES	**(10)**
Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing – Collaborating on Databases – String and Sharing Files.	
UNIT IV - OUTSIDE THE CLOUD	**(9)**
Evaluating Web Mail Services – Evaluating Instant Messaging – Evaluating Web Conference Tools – Creating Groups on Social Networks – Evaluating on Line Groupware – Collaborating via Blogs and Wikis.	
UNIT V - STORING AND SHARING	**(9)**
Understanding Cloud Storage – Evaluating on Line File Storage – Exploring on Line Book Marking Services – Exploring on Line Photo Applications – Exploring Photo Sharing Communities – Controlling it with Web Based Desktops. Introduction to Cloud Databases – Hadoop - Case Study.	
TOTAL (L: 45) = 45 PERIODS	

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REFERENCES:

1. Michael Miller, "Cloud Computing", Pearson Education, New Delhi, 2009.
2. Kai Hwang, Geoffrey C Fox, Jack G.Dongarra, "Distributed and Cloud Computing, from Parallel Processing to the Internet of Things", Morgan Kautomann Publishers, 2012.

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17RAX12 BUSINESS INTELLIGENCE					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Programme Outcomes**	
1.0	To impart knowledge in business intelligence.	**1.1**	Students will be able to know about various business intelligence architectures.	**b,c,d,e**	
2.0	To understand the various knowledge delivery concepts.	**2.1**	Students will be able to gain awareness in knowledge delivery.	**b,d,e,f**	
3.0	To provide knowledge in various Efficiency measures.	**3.1**	Students will be able to extract various business intelligence efficiency measures.	**b,f,g,h**	
4.0	To understand about various Business Intelligence Applications.	**4.1**	Students will be able to apply different business intelligence applications.	**i,j,k,l**	
5.0	To provide knowledge in Emerging Trends in Business Intelligence	**5.1**	Students will be able to know about future beyond Technology in business intelligence.	**i,j,k,l**	

UNIT I - BUSINESS INTELLIGENCE	**(9)**
Effective and timely decisions – Data, information and knowledge – 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 – Understanding the field of business intelligence in a global world.	
UNIT II - KNOWLEDGE DELIVERY	**(9)**
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 – Challenges of Business Intelligence – Real time Business Intelligence – 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.	
TOTAL (L:45)= 45 PERIODS	

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1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence Systems", Pearson, 9th Edition, 2013.
2. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making", Addison Wesley, 2003.
3. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", Wiley Publications, 2009.
4. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.

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17RAX13 ORGANIZATIONAL BEHAVIOR AND ENTREPRENEURSHIP				
L	T	P	C	
3	0	0	3	

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To understand the human interactions in an organization.	1.1	Students will be able to human behavior within groups or organizations and how this behavior can be modeled through analysis.	a,b,e,g,h
2.0	To understand process of leading individuals as a group to achieve a common objective.	2.1	Students will be able to various leadership styles and the power to resist and manage.	a,b,e,f,g
3.0	To understand entrepreneurship.	3.1	Students will be able to understand process of entrepreneur to be as own boss.	a,b,e,f,g
4.0	To understand about importance of motivation	4.1	Students will be able to acquire knowledge about motivation through training, self-assessment and how to manage stress.	a,b,f,g,h
5.0	To understand about financing and accounting in business.	5.1	Students will be able to acquire knowledge about management of capital and tax details.	a,b,g,i,l

UNIT I - ORGANIZATIONAL BEHAVIOUR	(9)
Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models - Personality – types – Factors influencing personality - Misbehaviour –Types – Management Intervention – Motivation –Types – Effects on work behavior – Organization Structure –Groups in organizations – Team building.	
UNIT II - LEADERSHIP AND POWER	**(9)**
Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics - Organizational change – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change.	
UNIT III – ENTREPRENEURSHIP	**(9)**
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur - Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Identifying and selecting a good business opportunity - Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	
UNIT IV – MOTIVATION	**(9)**
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	

UNIT V - FINANCING AND ACCOUNTING	(9)
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	
	TOTAL (L:45)= 45 PERIODS

REFERENCES:

1. Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 15th Edition, 2013.
2. Fred Luthans, Organisational Behavior, McGraw Hill, 11th Edition, 2001.
3. S.S.Khanka, "Entrepreneurial Development", 2013.
4. DonaldKuratko, "Entrepreneurship – Theory, Process and Practice", Cengage Learning, 9th Edition, 2014.

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17RAX14 SOFTWARE TESTING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB06					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To summarize the importance of software quality.	1.1	Students can know the importance of software testing to measure software quality.	a,b,c	
2.0	To recognize the fundamentals of software testing.	2.1	Students will know about Software Testing methodologies.	a,b,d	
3.0	To develop test cases using manual testing and to enable the learner to become a Software Tester.	3.1	Students will be able to design the test cases and to getting familiarity over testing tools.	b,d,g	
4.0	To interpret with Unit testing tool.	4.1	Students can practice unit testing tool JUnit Testing Tool	g,j,k	
5.0	To interpret with test management tool.	5.1	Students can practice test management tool Jira.	j,k,l	

UNIT I – INTRODUCTION TO QUALITY AND SOFTWARE QUALITY	(9)
Introduction-Historical Perspective of Quality-Definition of Quality-Total Quality Management-Continuous Improvement Cycle-Constraints of Software Quality Assessment-Software Development Process-Types of Products-Software Quality Management-Software has defects-Processes Related to Software Quality-Quality Management System Structure-Important Aspects of Quality Management.	
UNIT II - FUNDAMENTALS OF SOFTWARE TESTING	**(9)**
Definition of Testing-Approaches to Testing-Testing during Development Life Cycle-Requirements Traceability Matrix-Essentials of Software Testing-Workbench-Important Features of Testing Process-Test Planning-Test Team Efficiency and Approach-Testing Process-Test Methodologies/Approaches-Skills Required by Tester.	
UNIT III- TESTING TYPES AND DOCUMENTS PREPARATION	**(9)**
Unit Testing- Integration Testing – System Testing – Interaction Testing – Verification and Validation – Use case-Test Case-Bug Report Preparation.	
UNIT IV – JUNIT TOOL	**(9)**
JUnit – Overview – Test Framework – Annotations – API – Assertion – Writing a Test – Executing test – Suite Test – Exceptions Test – Parameterized Test.	
UNIT V- TEST MANAGEMENT TOOL (JIRA)	**(9)**
Introduction to Test Management tool - JIRA - Agile Methodology -- Scrum – Test Scenario preparation – Test Case Design Techniques - Test Case Preparation – RTM Mapping – Test Case Execution – Defect Life Cycle -- Bug reporting – Bug Tracking.	
TOTAL (L:45)= 45 PERIODS	

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REFERENCES:

1. M.G. Limaye, "Software Testing, Principles Techniques and Tools", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
2. Paul C. Jorgensen, "Software Testing, A Craftsman's Approach", CRC Press, Second Edition, 2007.
3. Java Code Geeks, "JUnit Programming Cookbook", Exelixis Media P.C., 2017. https://www.javacodegeeks.com/wp-content/uploads/2017/04/JUnit-Programming-Cookbook.pdf

URL:

Unit-IV

1. https://junit.org/junit5/docs/current/user-guide/#overview-getting-started-example-projects
2. https://www.tutorialspoint.com/junit/junit_writing_tests.htm
3. https://www.javacodegeeks.com/2014/11/junit-tutorial-unit-testing.html

Unit-V

1. https://artoftesting.com/software-testing-tutorial.html
2. https://www.tutorialspoint.com/jira/jira_overview.htm
3. https://confluence.atlassian.com/jirakb/using-jira-software-for-test-case-management-136872198.html

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17RAX15 CRYPTOGRAPHY AND NETWORK SECURITY					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB05					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	Understand the basic concept of Cryptography and Network Security, their mathematical models.	1.1	Students will be able to classify the symmetric encryption techniques	a,d,f	
2.0	Learn the classical encryption techniques and concepts of finite fields and number theory.	2.1	Students will be able to gain knowledge various Public key cryptographic techniques.	a,c,j,l	
3.0	Understand the message authentication and hash functions.	3.1	Evaluate the authentication and hash algorithms.	f,g,j	
4.0	To impart knowledge on Network security	4.1	Summarize the intrusion detection and its solutions to overcome the attacks	f,g,j,l	
5.0	Understand the basic concepts of system level security.	5.1	Basic concepts of system level security.	a,f,g,j	

UNIT I - SYMMETRIC CIPHER	**(9)**
Overview – Classical Encryption Techniques - Block Ciphers and the Data Encryption Standard – Euclid"s Algorithm - Polynomial Arithmetic - Advanced Encryption Standard.	
UNIT II - PUBLIC - KEY ENCRYPTION	**(9)**
Introduction to Number Theory - Public Key Cryptography and RSA - Key Management: Diffie Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.	
UNIT III - HASH FUNCTIONS	**(9)**
Cryptographic Hash Functions – Message Authentication Codes: Message Authentication Requirements, Functions, Security of MACs, MACs based on Hash Functions and Block Ciphers – Digital Signatures.	
UNIT IV - NETWORK SECURITY PRACTICE	**(9)**
Network Access Control and Cloud Security - Wireless Network Security: Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security - Electronic Mail Security: Pretty Good Privacy, S/MIME - IP Security.	
UNIT V - SYSTEM SECURITY	**(9)**
Malicious Software: Types of Malicious Software, Propagation, Payload - Intruders: Intrusion Detection, Password Management – Firewalls: Need for Firewalls, Characteristics, Types, Firewall Basing, Location and Configuration.	
	TOTAL (L:45)= 45 PERIODS

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REFERENCES:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Sixth Edition, Pearson Education, 2014.
2. Atul Kahate, "Cryptography and Network Security", Third Edition, Tata McGraw Hill Education (India) Private Limited, 2013.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, 2015.

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17RAX16 MOBILE COMPUTING					
		L	T	P	C
		3	0	0	3

PREREQUISITE: 17RAB05

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To get knowledge in Wireless communication Fundamentals.	1.1	Students will be able to gain knowledge in Wireless communications.	a,b,c
2.0	To understand the fundamentals of GSM & GPRS.	2.1	Students will be able to know about the working mechanism of GSM & GPRS.	d,e
3.0	To provide knowledge about Wireless Networks.	3.1	Students will be able to extract knowledge in Wireless Networks.	a,e,f
4.0	To understand about Network Layers.	4.1	Students will be able to apply knowledge in MANET Applications.	g,h,i
5.0	To provide knowledge in Transport and Application Layers.	5.1	Students will be able to gain awareness in WAP Architecture.	j,k,l

UNIT I - WIRELESS COMMUNICATION FUNDAMENTALS	**(9)**
Principles of Cellular Networks- Mobile Computing Applications - characteristics of Mobile computing - Overview of TDMA - CDMA - FDMA - 3G - TMT 2000, Overview of 4G.	
UNIT II - TELECOMMUNICATION SYSTEMS	**(9)**
GSM - Mobile Services - System Architecture - UMTS - Handover-Security - GPRS Architecture -Services.	
UNIT III - WIRELESS NETWORKS	**(9)**
Wireless LAN-Architecture-Types of Wireless LAN-IEEE 802.11 Architecture-Services- HIPERLAN-Bluetooth.	
UNIT IV - NETWORK LAYER	**(9)**
Mobile IP-Goals - Entities and Terminology- Agent Discovery – Registration - DHCP - Overview of DSDV & DSR - Mobile Ad-hoc Networks — MANET Applications.	
UNIT V - TRANSPORT AND APPLICATION LAYERS	**(9)**
Overview of Traditional TCP - Congestion Control - Slow Start - Fast Retransmit/Fast Recovery, Classical TCP improvements - Indirect TCP - Snooping TCP - WAP Architecture.	
TOTAL (L:45)= 45 PERIODS	

REFERENCES:

1. Jochen Schiller, "Mobile Communications", Second Edition (revised), Prentice Hall of India, Pearson Education, 2014.
2. Andreas F. Molisch,"Wireless Communications", Second Edition, Willy Publication, 2010.
3. B.S.Manoj, C.Siva Ram Murthy, "Adhoc Wireless Networks", Pearson Education, 2014.
4. Rappaport, "Wireless Communications: Principles and Practice", Pearson Education, India, 2009.
5. William Stallings, "Wireless Communications and Networks", Pearson Education, 2007.

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17RAX17 HEALTH CARE MANAGEMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To understand the basic concepts of health care system.	1.1	Students will be able to understand basic healthcare information laws and standards.	a,b,d	
2.0	To ensure access of clinical information system.	2.1	Students will be able to know current and emerging clinical information system.	a,b,c,d	
3.0	To understand IT that supports health care information system.	3.1	Students will be able to design a suitable HIS architecture.	c,d,j,k	
4.0	To understand IT governance and assessment of health care information system.	4.1	Students will be able to use research methods and analysis together to plan the management of IT challenges.	c,i,j,k	
5.0	To understand about Information Technology initiatives.	5.1	Students will be able to use research methods and analysis together and do IT initiatives and Case Studies.	c,i,j,k,l	

UNIT I – INTRODUCTION	**(9)**
Introduction to Health Care Information – Health Care Data Quality – Health Care Information Regulations, Laws and Standards.	
UNIT II - HEALTH CARE INFORMATION SYSTEMS	**(9)**
History and evolution of health care information systems – Current and emerging use of clinical information systems– system acquisition – System implementation and support.	
UNIT III - INFORMATION TECHNOLOGY	**(9)**
Information architecture and technologies that support health care information systems – Health care information system standards – Security of health care information systems.	
UNIT IV - MANAGEMENT OF IT CHALLENGES	**(9)**
Organizing information technology services – IT alignment and strategic planning – IT governance and management.	
UNIT V- IT INITIATIVES	**(9)**
Management's role in major IT initiatives – Assessing and achieving value in health care information systems. Case study.	
TOTAL (L:45)= 45 PERIODS	

REFERENCES:

1. Karen A Wager, Frances W. Lee, John P Glaser, "Health Care Information Systems: A Practical Approach for Health Care Management", Fourth Edition, John Wiley, 2017.
2. Charlotte Weaver, Marion J. Ball, George R.kim, Joan M.Kiel ,"Healthcare Information Management Systems: Cases, Strategies, and Solutions", Springer, Fourth Edition, 2015.
3. Rudi Van De Velde and Patrice Degoulet, "Clinical Information Sytems: A Componenet based approach", Springer 2006.
4. Kevin Beaver, Healthcare Information Systems, Second Edition Best Practices, CRC Press, 2002.
5. Marion J. Ball Healthcare Information Management Systems: A Practical Guide Springer-Verlag GmbH, 1995.

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17RAX18 TECHNICAL DOCUMENTATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To learn the needs for documentation.	1.1	Students will be able to write documentation of projects or products, so that readers can understand the documentation.	e,f,g,j	
2.0	To learn in developing appropriate process steps and documentation.	2.1	Students will be able to develop appropriate process steps and documentation for effective and successful projects and products.	e,f,g,j	
3.0	To provides guidelines to develop process and documentation tools that address the particular needs of organization.	3.1	Students will be able to develop process and use documentation tools.	e,f,g,j	
4.0	To define strategy for developing a project or product.	4.1	Students will be able to plan disaster management and recovery.	e,f,g,j,l	
5.0	To know about standards and templates.	5.1	Students will be able to know various standards and templates.	e,f,g,j,l	

UNIT I – OVERVIEW	(9)
Introduction - Plan for Success - Elements of Process, Documentation Tools: Types of Documentation, Labeling, Other Documentation Tasks, Symbols, Cross-Referencing Documentation, Specifications.	
UNIT II - STYLE GUIDE AND MEETINGS	**(9)**
Definition of Document - General Structure of Documents: Page Layout, Standard Writing Practices, Image File Formats - Document Creation and Editing: Permissions, Citing References, Terms, Copyright, Trademark, and Legal Notices, Document Numbering, Maintaining Corporate Image Consistency - Corporate Identity – Reference Books. Organization - Responsibility of the Chairperson, Challenges of Working Remotely, Developing a Scope of Work and Work Plan, Decision Making, Leadership.	
UNIT III - SYSTEMS ENGINEERING	**(9)**
Systems Theory - Systems Engineering Process, Functional Analysis, Evaluation and Decision, Description of System Elements. Phases of a Typical System Design Project: Electronic System Design, Detailed Design, Budget Requirements Analysis, Feasibility Study and Technology Assessment. Program Management: Executive and Project Manager, System Engineer, Other Project Team Members.	
UNIT IV - CONCURRENT ENGINEERING, DISASTER PLANNING AND RECOVERY	**(9)**
Team Process - Process View of Production: QFD, DOE, Robust Design. Developing a Disaster Plan – Emergency Management: Planning Process, Managing Risk, Risk Assessment and Business Resumption Planning, Workplace Safety, Outside Plant Communication Links, Emergency Power and Batteries, Air Handling Systems, Water Hazards, Alternate Sites, Security, Managing Fear.	

UNIT V- STANDARDS, REFERENCE AND TEMPLATES	(9)
Standards Development Organization, Professional Society Engineering Committees, History of Modern Standards. Principal Standard Organizations: ISO, IEC, ITU, ANSI, Tabular Data, Final Thoughts.	
TOTAL (L:45)= 45 PERIODS	

REFERENCES:

1. Jerry C.Whitaker, Robert K. Mancini, "Technical Documentation and Process", CRC Press, Taylor & Francis Group, NewYork, 2013.
2. Kieran Morgan, "Technical Writing Process", Lightning Source Inc, First Edition, 2015.
3. Thomas T. Barker, "Writing Software Documentation – A Task-Oriented Approach", Pearson Education, Second Edition, 2003.

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17RAX19 DATABASE ADMINISTRATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB01					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To understand the fundamentals of Database.	1.1	Students will be able to practice in Database Architecture.	a,b,d	
2.0	To provide an idea for Managing tablespace and Storage Management.	2.1	Students will be able to gain knowledge in Storage Management.	d,h,i	
3.0	To provide knowledge in Database Management And Monitoring Space.	3.1	Students will be able to extract knowledge in Data Dictionary.	h,i,j	
4.0	To understand about Managing Transactions And Database Tuning.	4.1	Students will be able to apply Database Tuning and Managing Transactions.	j,k,l	
5.0	To provide knowledge in Database security, Backup and Recovery.	5.1	Students will be able to gain awareness about Recovery and Security methods in DB Administration.	c,k,l	

UNIT I - INTRODUCTION OF DATABASE ARCHITECTURE	(9)
An Overview of Databases and Instances-Logical Storage Structures-Logical Database Structures-Physical Storage Structures-Multiplexing Database Files- Memory Structures-Overview of Backup/Recovery-Security Capabilities-Real Application Clusters-Software Installation- DBA types –Database Design.	
UNIT II - MANAGING TABLESPACES AND STORAGE MANAGEMENT	**(9)**
Planning and Managing Tablespaces: Tablespace Architecture-Installation Tablespaces-Segment Segregation-Physical Database Layouts and Storage Management: Traditional Disk Space Storage- Automatic Storage Management.	
UNIT III - DATABASE MANAGEMENT AND MONITORING SPACE	**(9)**
Resource Management and Stored Outlines-Supporting Tables Based on Abstract Datatypes-Quiescing and Suspending the Database-Supporting Iterative Development-Managing Package Development-Common Space Management Problems-Segments, Extents and Blocks-Data Dictionary and Dynamic Performance Views-Space Management Methodologies-Built-in Space Management Tools-Space Management Scripts.	
UNIT IV - MANAGING TRANSACTIONS AND DATABASE TUNING	**(9)**
Basics of Transaction-Undo Basics-Managing Undo Tablespaces-Flashback Features-Tuning Application Design-Tuning SQL-Tuning Memory Usage-Tuning Data Access-Tuning Data Manipulation-Tuning Physical Storage-Reducing Network Traffic-Using STATSPACK and the Automatic Workload Repository - Database Availability.	
UNIT V - DATABASE SECURITY,AUDITING,RAC,BACKUP AND RECOVERY	**(9)**
Using STATSPACK-Database Authentication-Database Authorization-Auditing-Data Encryption Techniques-RAC Database Characteristics-RAC Maintenance-Logical Backups-Physical Backups-Using Data Pump Export and Import-RMAN Features and Components-Overview of RMAN Commands and Options-Backup Operations-Recovery Operations.	
	TOTAL (L:45)= 45 PERIODS

REFERENCES:

1. Kevin Loney, Bob Bryla "Database Administration", Tata McGraw Hill, New Delhi, 2011.
2. Craig S.Mullins, "Database Administration", Pearson Education, Second Edition, 2013.

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17RAX20 SOCIAL NETWORK ANALYSIS

L	T	P	C
3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To understand about semantic web and related applications.	1.1	Students will be able to proceed with various Applications of Social Network	a,b,c,d
2.0	To understand about knowledge representation using ontology.	2.1	Students will be able to gain awareness about ontology and their in semantic web.	d,e,f,g
3.0	To provide knowledge in extracting and mining communities in web social networks.	3.1	Students will be able to know about various communities of in social networks.	a,f,g
4.0	To understand human behavior in social web and related communities.	4.1	Students will be able to know about Understanding and predicting human behavior for social communities.	f,g,h,i
5.0	To provide knowledge in visualization of social networks.	5.1	Students will be able to understand various applications of social networks.	j,k,l

UNIT I – INTRODUCTION (9)

Introduction to Semantic Web: Limitations of current Web – Development of Semantic web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web based networks – Applications of Social Network Analysis- Case Study.

UNIT II - MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION (9)

Ontology and their role in the Semantic Web: Ontology based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modeling and aggregating social network data: State-of-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations – Case Study.

UNIT III - EXTRACTING AND MINING COMMUNITIES IN WEB 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 – Tools for detecting communities social network infrastructures and communities.

UNIT IV - PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES (9)

Understanding and predicting human behavior for social communities – User data management - Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis.

UNIT V- VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS (9)

Graph theory – Centrality – Clustering – Node – Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix – based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks – Facebook – Twitter – Linkedin.

TOTAL (L:45)= 45 PERIODS

REFERENCES:

1. Peter Mika, "Social Networks and the Semantic Web", Springer, First Edition, 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, First Edition, 2010.
3. Stephen P Borgatti, Martin G Everett, Jeffrey C Johnson "Analyzing Social Networks", Sage, Second Edition, 2018.
4. Easley and Kleinberg, Networks, Crowds, and Markets "Reasoning about a highly connected world", Cambridge Univ. Press, 2010.

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17RAX21 OBJECT ORIENTED ANALYSIS AND DESIGN

L	T	P	C
3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To provide a brief, hands-on overview of object-oriented analysis in software process.	1.1	Students will be able to identify state & behavior of real world objects.	a,b,c
2.0	To develop object-oriented models and identify implementation strategies.	2.1	Students will be able to understand various object oriented methodologies and choose the appropriate one for solving the problem with the help of various case studies.	a,b,c
3.0	To demonstrate and apply basic object oriented techniques to object oriented analysis.	3.1	Students will be able to understand the concept of analysis and identify object, relationships, attributes, methods.	b,d,j
4.0	To understand and apply design process and techniques for object oriented software.	4.1	Students will be able to implement design in developing a software project.	b,c,i,k,l
5.0	To discuss object relational systems and quality assurance.	5.1	Students will be able to understand importance of quality assurance and testing strategies.	b,i,j,k,l

UNIT I – INTRODUCTION (9)

An overview – Object basics – Object state and properties – Behavior – Methods – Messages – Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle.

UNIT II - METHODOLOGY AND UML (9)

Introduction – Survey – Rumbugh, Booch, Jacobson methods – Patterns – Frameworks – Unified approach – Unified modelling language – Static and Dynamic models – UML diagrams – Dynamic modeling – Model organization – Extensibility.

UNIT III - OBJECT ORIENTED ANALYSIS (9)

Identifying Usecase – Business object analysis – Use case driven object oriented analysis – Use case model – Documentation – Classification – Identifying object, relationships, attributes, methods – Super-sub class – A part of relationships Identifying attributes and methods – Object responsibility.

UNIT IV - OBJECT ORIENTED DESIGN (9)

Design process – Axioms – Corollaries – Designing classes – Class visibility – Refining attributes – Methods and protocols – Object storage and object interoperability.

UNIT V - DATABASES AND QUALITY ASSURANCE (9)

Databases – Object relational systems – Designing interface objects – Macro and Micro level processes – The purpose of a view layer interface. Quality assurance – Testing strategies – Test cases – Automated Testing Tools.

TOTAL (L:45)= 45 PERIODS

REFERENCES:

1. Ali Bahrami, "Object Oriented System Development", McGraw Hill International Edition, 2008.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Addison Wesley Longman, Second Edition, 2004.
3. Craig Larman, "Applying UML and Patterns", Pearson Education, Third Edition, 2005.
4. https://artoftesting.com/software-testing-tutorial.html (Unit-V)

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17RAX22 ADVANCED DATABASE MANAGEMENT SYSTEMS					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB01					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To impart knowledge in Transaction Processing and Concurrency Control.	1.1	Students will be able to proceed transaction properties, concurrency control techniques and Deadlock handling.	a,b,j
2.0	To understand the various Databases, its security issues and recovery	2.1	Students will be able to gain awareness about Recovery and Security methods in Database.	d,k,l
3.0	To provide knowledge in objects and XML Models.	3.1	Students will be able to extract XML Documents from Relational Databases.	b,j,k,l
4.0	To understand about Distributed Database and its current trends.	4.1	Students will be able to apply a various Current Trends in Distributed Databases	g,h,i
5.0	To provide knowledge in Enhanced Data Models for Advanced Applications	5.1	Students will be able to understand various types of advanced database concepts such as Spatial database, Multimedia database.	j,k,l

UNIT I - TRANSACTION PROCESSING AND CONCURRENCY CONTROL	(9)
Introduction to Transaction Processing - Transaction and System Concepts - Desirable properties of Transaction - Characterizing Schedules based on Recoverability and Serializability. Concurrency Control Techniques: Two-Phase Locking Techniques - Concurrency Control based on Timestamp Ordering – Deadlock Handling & Recovery.	
UNIT II - RECOVERY AND SECURITY	**(9)**
Recovery concepts- Recovery Techniques: Deferred update – Immediate update – shadow paging. Introduction to database security issues- Discretionary Access Control based on Granting and Revoking privileges- Mandatory Access Control and Role-based Access Control for Multilevel security - kinds of failures.	
UNIT III - OBJECT AND XML MODELS	**(9)**
Overview of Object-Oriented concepts- Object Identity, object structure and type constructors- Encapsulation of operations, methods and persistence- Type and class Hierarchies and Inheritance – Complex Objects. XML: Structured, Semi-structured, and Unstructured Data -XML Hierarchical (Tree) Data Model -XML Documents, DTD, and XML Schema - Storing and Extracting XML Documents from Databases - XML Languages -Extracting XML Documents from Relational Databases.	
UNIT IV - DISTRIBUTED DATABASES	**(9)**
Distributed Database Concepts - Types of Distributed Database Systems -Distributed Database Architectures - Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design - Query Processing and Optimization in Distributed Databases -Overview of Transaction Management in Distributed Databases -Overview of Concurrency Control and Recovery in Distributed Databases -Distributed Catalog Management -Current Trends in Distributed Databases – Reliability.	
UNIT V- ENHANCED DATA MODELS FOR ADVANCED APPLICATIONS	**(9)**
Active Database Concepts and Triggers -Temporal Database Concepts - Spatial Database Concepts -Multimedia Database Concepts -Introduction to Deductive Databases.	
	TOTAL (L:45)= 45 PERIODS

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REFERENCES:

1. R. Elmasri, S.V. Navathe, "Fundamentals of Database Systems", Pearson Education, Sixth Edition, 2013.
2. Henry F. Korth, Abraham Silberschatz, S. Sudarshan," Database System Concepts", McGraw-Hill International Publications, Sixth Edition, 2010.
3. Date C.J., "An Introduction to Database Systems", Addison-Wesley, Eighth Edition, 2004.
4. Raghu Ramakrishnan, "Database Management Systems", McGraw Hill Education, Third Edition, 2003.

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17RAX23 WEB SERVER ADMINISTRATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Programme Outcomes**	
1.0	To provide understandability about basics of server environments.	**1.1**	Students will be able to know about web environment, server environment and network details.	**a,b,e,g**	
2.0	To provide knowledge about installation and configuring details about servers.	**2.1**	Students will be able to know about server, hardware details, file system selection, configuration of TCP/IP in Windows and Linux and configuration of DNS in Windows and Linux.	**a,b,e,g,k**	
3.0	To provide knowledge about how to manage server.	**3.1**	Students will be able to gain knowledge about managing users and groups, managing file system permissions and the details about websites in IIS, Apache servers.	**a,b,e,g,k**	
4.0	To understand about extended web environment services.	**4.1**	Students will be able to gain understandability in email services, FTP services and Telnet and terminal services.	**a,b,e,g,k**	
5.0	To gain knowledge about how to secure and monitor web environment.	**5.1**	Students will be able to gain knowledge about threats, how to secure data transmission, server applications and analysis about tools for web servers.	**a,b,e,g,k**	

UNIT I - INTRODUCTION AND BASICS	**(9)**
Web environment - Server Environment - OSI Model - TCP/IP Model - Bandwidth and Throughput - Web Hosting Solutions - File servers - Application Servers - Server components - Disaster assessment and recovery - Network Components - Setting up IP Addressing.	
UNIT II - SETTINGS UP SERVER	**(9)**
Single-Boot and Multi-Boot Systems - Checking Hardware Compatibility - Naming Computers - Identifying Devices - Selecting a File System - Installing Microsoft Windows Server - Installing Red Hat Linux - An Introduction to Linux Commands - Configuring TCP/IP in Windows and Linux - Domain Name Service (DNS) - Components of DNS - Configuring DNS in Linux and Windows.	
UNIT III - MANAGING A SERVER	**(9)**
Managing Users and Groups - Managing Files System Permissions - Features of HTTP - Installing Web Server - Apache Web Server - Internet Information Services (IIS) - Hosting Multiple Web Sites - IIS Properties - Apache Properties - New Web Sites in IIS - New Web Sites (Virtual Hosts) in Apache - Virtual Directories.	
UNIT IV - EXTENDING THE WEB ENVIRONMENT	**(9)**
Email Environment - Role of DNS in Email - Email protocols - Microsoft Exchange Architecture - Web-based Email clients - FTP Services - NEWS Server - Remote Access to a Server - Telnet and Terminal services - Streaming Media Servers - E-commerce Servers.	

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UNIT V- SECURING AND MONITORING WEB ENVIRONMENT	(9)
Threats and Vulnerabilities - Securing Data Transmission - Securing Server Applications - Authenticating Web Users - Firewall - Proxy Server - Intrusion Detection Software - Monitoring Web Server Applications - Monitoring DNS, Email applications and FTP - Analysis tools for Web Servers.	
	TOTAL (L:45)= 45 PERIODS

REFERENCES:

1. Steve Silva, "Web Server Administration", Cengage Learning, 2007
2. Ken Schaefer et al., "Professional Microsoft IIS 8", Wrox Publications, 2013.
3. Ken Coar and Rick Bowen, "Apache Cookbook", Second Edition, 2012.

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17RAX24 COMPILER DESIGN					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	Learn the design principles of a Compiler	1.1	The students will be able to apply the knowledge of lex tool &yacc tool to develop a scanner & parser..	a,b,e	
2.0	To understand the complier construction tools.	2.1	The students will be able to design experiments for Intermediate Code Generation in compiler	c,g,j	
3.0	To understand, design and implement the different parsing techniques.	3.1	The students will be able to design a software system for backend of the compiler	b,c,j	
4.0	To learn and design intermediate code generation schemes and run time environment	4.1	The students will be able to learn how to optimize and effectively generate machine codes	a,d,g	
5.0	To learn how to optimize and effectively generate machine codes.	5.1	The students will be able to analyze the storage allocation strategies in run time environment.	b,g,i	

UNIT I – INTRODUCTION TO COMPILER	**(9)**
Translators - Compilation and Interpretation - Language processors - Introduction to compiling – Analysis of the source program –The phases of a compiler – Cousins of a compiler – The grouping of phases - compiler writing tools – bootstrapping.	
UNIT II - LEXICAL ANALYSIS SYNTAX ANALYSIS	**(9)**
The role of the lexical analyzer – Input buffering – Specification and Recognition of tokens – Finite Automata – Conversion of NFA to DFA - Construction of NFA from Regular Expression. Role of the parser –Writing Grammars – Context-Free Grammars.	
UNIT III - TOP DOWN & BOTTOM UP PARSING	**(9)**
Top down parsing– Recursive descent parsing, Predictive parsing – LL(1) Grammars. Bottom up parsing – LR parsers – Construction of a simple SLR, CLR and LALR parsing table.	
UNIT IV - INTERMEDIATE CODE GENERATION AND RUN TIME ENVIROMENT	**(9)**
Intermediate languages – Declarations – Assignment statements – Boolean expressions – Case statements – Back patching – Procedure calls. Run - Time Environments – Source language issues – Storage- allocation strategies.	
UNIT V - CODE GENERATION AND CODE OPTIMIZATION	**(9)**
Issues in the design of a code generator – The Target machine – Run time storage management – Register allocation and assignment – The DAG representation of basic blocks – The Principle sources of Optimization – Peephole Optimization – Optimization of basic blocks.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Alfred V. Aho, Ravi Sethi Jeffrey D. Ullman, "Compilers – Principles, Techniques, and Tools", Pearson Education Asia, 2013.
2. Steven S. Muchnick, "Advanced Compiler Design & Implementation", Morgan Kaufmann Publishers, 2003.
3. C. N. Fisher and R. J. LeBlanc "Crafting a Compiler with C", Pearson Education, 2011.
4. SudhaSadasivam G, "Compiler Design", Scitech Publications (India) Private Limited, Chennai, 2010
5. Dhamdhere D M, "Compiler Construction Principles & Practice", Macmillan India Limited, New Delhi, 1997. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.

17RAX25 DISTRIBUTED COMPUTING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB05, 17RAB03					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To learn the principles of a Distributed Computing	1.1	Students will be able to familiar about basics of Distributed computing, Distributed Operating System and Message Passing	a,c
2.0	To learn about Remote Procedure Call.	2.1	Students will be able to implement RPC Mechanism.	a,b,c
3.0	To understand Distributed Shared Memory	3.1	Students will be able to familiar design and implementation of DSM	a,c,l
4.0	To familiar about resource and process management	4.1	Students will be able to explore various approaches of resource and process management	a,c,l
5.0	To familiar distributed file systems and naming.	5.1	Students will be able to know how to access files located in different locations and naming convention.	a,c,l

UNIT I – INTRODUCTION AND MESSAGE PASSING	(9)
Fundamentals: Distributed computing, System Model, Distributed Operating System, Designing Operating System, Introduction to DCE. Message Passing: Desirable Features Message Passing System, Issues in Message Passing, Synchronization, Buffering, Multi-Datagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.	
UNIT II - REMOTE PROCEDURE CALL	**(9)**
Remote Procedure Call: RPC model, Transparency of RPC, implementing RPC mechanism, Stub generation, Marshaling arguments and Results, Server Management, Parameter-passing Semantics, call Semantics, Communication protocols for RPCs, Complicated RPC Client server binding, Exception Handling, Security, special types of RPCs, RPCs in Heterogeneous Environments, Lightweight RPC, Optimizations for better performance.	
UNIT III - DISTRIBUTED SHARED MEMORY	**(9)**
Distributed Shared Memory: General architecture of DSM systems, Design and implementation of DSM, Granularity, structure of shared memory space, consistency models, Replacement Strategy, Thrashing, other approaches to DSM, Heterogeneous DSM, and Advantages of DSM.	
UNIT IV – SYNCHRONIZATION, RESOURCE AND PROCESS MANAGEMENT	**(9)**
Synchronization: Clock Synchronization, Event Ordering, Mutual Exclusion, Deadlock, Election Algorithm. Resource and Process Management : Desirable Features of Global Scheduling Algorithm, Task Assignment Approach, Load Balancing Approach, Load Sharing Approach, Introduction to Process Management, Process Migration, Threads.	
UNIT V - DISTRIBUTED FILE SYSTEMS AND NAMING	**(9)**
Distributed File Systems: Introduction, Good Features of DFS, File Models, File Accessing Models, File Sharing Semantics, File-Caching Schemes, File Replication, Fault Tolerance, Atomic Transactions and Design Principles. Naming: Introduction, Desirable features of Naming System, Fundamental Concepts, System Oriented Names, Object Locating Mechanisms, Human Oriented Names, Name Caches and Naming and Security.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Pradeep K Sinha " Distributed Operating Systems : Concepts and design" IEEE Computer Society Press.
2. A. Tanuenbaum "Distributed Operating System" Pearson Edition.
3. Puder, Romer "Distributed Systems Architecture : Middleware approach" Elsevier Publication.
4. G. Coulouris, J. Dollimore and T. Kindberg "Distributed Systems : Concepts and design" Pearson Edition.
5. M. Singhal, N. Shivaratri " Advanced Concepts in Operating Systems" TMH.

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17RAX26 PROFESSIONAL ETHICS				
	L	T	P	C
	3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To understand the core values that shapes the ethical behavior of an engineer.	1.1	Students will be able to deal with complex situations with the people in the society in making the work environment congenial, encouraging and loving.	a,b,d
2.0	To inculcate a spirit of togetherness, unity and team work in an organization.	2.1	Students will be able to understand the basic ethical theories discussing the ethics of good and bad patterns of character.	c,f,g
3.0	To make him reasonably a "good professional conscious of his duties to the society.	3.1	Students will be able to understand the basics regarding the code of ethics and get a balanced outlook on law.	f,g,h
4.0	To give an overview of sense of social responsibility and security.	4.1	Students will be able to implement the concepts in one's career for achieving excellent job satisfaction.	d,e,g,h
5.0	To make him aware of the global issues in professional ethics.	5.1	Students will be able to understand the global issues and get expertise and provide moral leadership.	b,d,f,i,l

UNIT I - HUMAN VALUES	**(8)**
Morals, Values and Ethics – Integrity, Work Ethic and Service Learning –Virtues – Respect for Others – Living Peacefully – Caring, Sharing and Honesty – Courage, Valuing Time and Co-operation – Commitment, Empathy and Self-Confidence – Challenges in the Work Place – Spirituality.	
UNIT II - ENGINEERING ETHICS	**(8)**
Senses of 'Engineering Ethics' - Variety of moral issues - Types of inquiry - Moral Dilemmas - Moral Autonomy – Moral Development - Consensus and Controversy – Profession – Self-Respect and Senses of Responsibility - Theories about Right action – Self –interest, customs and religion.	
UNIT III - ENGINEERING AS SOCIAL EXPERIMENTATION	**(9)**
Engineering as experimentation - Engineers as responsible experimenters - Codes of Ethics – Industrial Standards - A balanced outlook on law – Case Study: The challenger.	
UNIT IV - ENGINEER'S RESPONSIBILITY FOR SAFETY	**(10)**
Safety and risk - Assessment of safety and risk - Risk benefit analysis and reducing risk – Case Study: Three mile island and Chernobyl. Collegiality and Loyalty - Respect for Authority - Collective Bargaining - Confidentiality - Conflicts of Interest - Occupational crime - Human rights and Employee rights.	
UNIT V - GLOBAL ISSUES	**(10)**
Multinational corporations - Environmental ethics - Computer ethics - Engineers as managers - Consulting engineers - Engineers as expert witnesses and advisors - Moral leadership.	
	TOTAL (L: 45) = 45 PERIODS

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REFERENCES:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 2006.
2. R. S. Naagarazan, "A textbook on Professional Ethics and Human Values", New Age International Publishers, New Delhi, 2006.
3. Charles B. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004.
4. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000.

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17RAX27 SOFTWARE PROJECT MANAGEMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	Outline the project planning for the software process.	1.1	Express the Project planning and estimation activities during the project scheduling of any software application.	a,b,c
2.0	Describe the project evaluation and costing of the project.	2.1	Practice the knowledge about project evaluation and costing of the project.	b,c,d
3.0	Explain the quality concepts for ensuring the functionality of the software	3.1	Predict the knowledge to create reliable, replicable costestimation that links to the requirement of project planning and managing.	a,d,k
4.0	Review the risk management and resource allocation.	4.1	Solve the Risk and create risk mitigation plan.	b,c,l
5.0	Illustrate the use of Software Quality management	5.1	Apply software quality management for better quality software delivery	b,d,k

UNIT I - SOFTWARE PROJECT MANAGEMENT CONCEPTS	(9)
Introduction to software project management: An Overview of Project Planning: Select Project, Identifying Project Scope and objectives, infrastructure, project products and characteristics. Estimate efforts, Identify activity risks, and Allocate resources.	
UNIT II - SOFTWARE EVALUATION AND COSTING	**(9)**
Project Evaluation: Strategic Assessment, Technical Assessment, Cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of an Appropriate Project approach: Choosing technologies, choice of process models, structured methods.	
UNIT III - SOFTWARE ESTIMATION AND TECHNIQUES	**(9)**
Software Effort Estimation: Problems with over and under estimations, Basis of Software Estimation, Software estimation techniques, expert judgement, Estimation by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, Networks planning models, formulating a network model.	
UNIT IV - RISK MANAGEMENT	**(9)**
Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost Scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.	
UNIT V - SOFTWARE QUALITY MANAGEMENT	**(9)**
Defining Software Quality - ISO9126 – Product and Process Metrics – Product vs Process Quality Management – Quality Management Systems – Process Capability Models – Techniques to help enhance Software Quality – Testing – Software Reliability – Quality Plans.	
	TOTAL (L: 45) = 45 PERIODS

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REFERENCES:

1. Bob Hughes & Mike Cotterell, "Software Project Management", Tata McGraw – Hill Publications, Fifth Edition, 2012.
2. S.A. Kelkar, "Software Project Management", PHI, New Delhi, Third Edition, 2013.
3. Richard H. Thayer, "Software Engineering Project Manangement", IEEE Computer Society.
4. Futrell, "Quality Software Project Management", Pearson Education India, 2008.

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17RAX28 CYBER SECURITY					
		L	T	P	C
		3	0	0	3
PREREQUISITE: 17RAB05					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To impart knowledge in Cyber Security.	1.1	Students will be able to understand various types of attacks in networks.	a,b,c,d	
2.0	To understand the various security measures in operating system and networks.	2.1	Students will be able to gain awareness about security design in operating system and denial of service in network.	a,d,c	
3.0	To provide knowledge in Security Counter Measures	3.1	Students will be able to know about Firewalls and Prevention methods.	d,e,f	
4.0	To understand about Privacy in Cyberspace.	4.1	Students will be able to apply a various emerging technologies in cyberspace.	g,h,i	
5.0	To provide knowledge in Management and Incidents.	5.1	Students will be able to understand security planning and dealing with disaster.	j,k,l	

UNIT I - INTRODUCTION TO CYBER SECURITY	(9)
Introduction – Computer Security – Threats – Harm – Vulnerabilities – Controls – Authenticate Access Control and Cryptography – Web-User Side – Browser Attacks – Web Attacks Targeting Users – Obtaining User or Website Data – Email Attacks.	
UNIT II - SECURITY IN OPERATING SYSTEM & NETWORKS	**(9)**
Security in Operating Systems – Security in the Design of Operating Systems – Rootkit – Network security attack – Threads to Network Communications – Wireless Network Security – Denial of Service – Distributed Denial-of-Service.	
UNIT III - DEFENCES: SECURITY COUNTER MEASURES	**(9)**
Cryptography in Network Security – Firewalls – Intrusion Detection and Prevention Systems – Network Management – Databases – Security Requirements of Databases – Reliability and Integrity – Database Disclosure – Data Mining and Big Data – Mobile Platform and Application Security.	
UNIT IV - PRIVACY IN CYBERSPACE	**(9)**
Privacy Concepts – Privacy Principles and Policies – Authentication and Privacy – Data Mining – Privacy on the Web – Email Security – Privacy Impacts of Emerging Technologies – Where the Field is Headed.	
UNIT V - MANAGEMENT AND INCIDENTS	**(9)**
Security Planning –Business Continuity Planning – Handling Incidents – Risk Analysis – Dealing with Disaster – Emerging Technologies – The Internet of Things – Security and Privacy– Economics –Electronic Voting – Cyber Warfare – Cyberspace and the Law – International Laws – Cyber Crime –Cyber Warfare and Home Land Security- Case Study.	
TOTAL (L: 45) = 45 PERIODS	

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REFERENCES:

1. Charles P.Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, "Security in Computing", 5th Edition, Pearson Education, 2015.
2. Lane Thames, Dirk Schaefer "Cybersecurity for Industry 4.0 Analysis for Design and Manufacturing", Springer, 2017.
3. George K.Kostopoulous, "Cyber Space and Cyber Security", CRC Press, 2013.
4. Martti Lehto, Pekka Neittaanmäki, "Cyber Security: Analytics, Technology and Automation", Springer International Publishing, Switzerland 2015.
5. Jeremy Swinfen, "Green Cyber Security: An Introduction for Non - Technical Managers", Routledge Taylor & Francis Group, London and New York, 2015.

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17RAX29 IMAGE PROCESSING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To impart knowledge about fundamentals of image processing.	1.1	Students will be able to understand steps in image processing and various types of file formats, operations, etc.	a,b,c,d	
2.0	To understand the various image enhancement techniques.	2.1	Students will be able to gain awareness about image processing, filtering, smoothing and sharpening details.	a,b,c,d	
3.0	To understand about segmentation and feature analysis.	3.1	Students will be able to know how to segment an image and work with edges, boundary and how to analysis features.	a,b,c,d	
4.0	To learn about multi resolution analysis and compressions.	4.1	Students will be able to aware about image pyramids and various compression methods.	a,b,c,d,i,j,l	
5.0	To aquire knowledge about various application of image processing.	5.1	Students will be able to aware about classifying and recognizing image and know about steganography, mosaics, etc..	a,b,c,d,i,j,k,l	

UNIT I - FUNDAMENTALS OF IMAGE PROCESSING	(9)
Introduction - Steps in image processing systems - Image acquisition - Sampling and Quantization - Pixel relationships - Color fundamentals and models - File Formats, Image operations: Arithmetic, Geometric and Morphological.	
UNIT II - IMAGE ENHANCEMENT	**(9)**
Spatial Domain - Gray level transformations - Histogram processing - Spatial filtering - Smoothing and sharpening - Frequency domain: Filtering in frequency domain - DFT, FFT, DCT - Smoothing and sharpening filters - Homomorphic filtering.	
UNIT III - IMAGE SEGMENTATION AND FEATURE ANALYSIS	**(9)**
Detection of discontinuities - Edge operators - Edge linking and boundary Detection - Thresholding - Region based segmentation - Morphological Watersheds - Motion segmentation, Feature analysis and extraction	
UNIT IV - MULTI RESOLUTION ANALYSIS AND COMPRESSIONS	**(9)**
Multi Resolution analysis: Image pyramids - Multi resolution expansion - Wavelet transforms - Image compression : Fundamentals - Models - Elements of information theory - Error free compression - Lossy compression - Compression standards.	
UNIT V - APPLICATIONS OF IMAGE PROCESSING	**(9)**
Image classification - Image recognition - Image understanding - Video motion analysis - Image fusion - Steganography - Digital compositing - Mosaics - Color image processing.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", Third Edition, Pearson Education, 2009.
2. S.Sridhar, "Digital Image Processing", Oxford University Press, 2011.
3. Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Second Edition, Thompson Learning, 2007.
4. Anil K.Jain, "Fundamentals of Digital Image Processing", PHI, 2011.
5. Sanjit K. Mitra, & Giovanni L. Sicuranza, "Non Linear Image Processing", Elsevier, 2007.

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17RAX30 NATURAL LANGUAGE PROCESSING					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		Course Outcomes		Related Programme Outcomes	
1.0	To understand about the basics of Natural Language Processing.	1.1	Students will be able to impart knowledge about syntax, semantics and pragmatics of Natural Language Processing.	a,b,c	
2.0	To understand about morphology and part of speech tagging.	2.1	Students will be able to gain awareness about the linguistic essentials and Hidden Markov Models.	a,b,c	
3.0	To get knowledge about syntax parsing.	3.1	Students will be able to know about formation of grammar, parsing with Context Free Grammars.	a,b,c,j	
4.0	To understand about semantic analysis.	4.1	Students will be able to know about various approaches and semantic parsing.	a,b,c,j	
5.0	To make aware of various applications of natural language processing.	5.1	Students will be able to get knowledge applications such as machine translation, question answering, word alignment, etc.	j,k,l	

UNIT I - INTRODUCTION	(9)
Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues - Applications - The role of machine learning - Probability Basics –Information theory – Collocations -N-gram Language Models - Estimating parameters and smoothing - Evaluating language models.	
UNIT II - MORPHOLOGY AND PART OF SPEECH TAGGING	**(9)**
Linguistic essentials - Lexical syntax- Morphology and Finite State Transducers - Part of speech Tagging - Rule-Based Part of Speech Tagging - Markov Models - Hidden Markov Models – Transformation based Models - Maximum Entropy Models. Conditional Random Fields.	
UNIT III - SYNTAX PARSING	**(9)**
Syntax Parsing - Grammar formalisms and tree banks - Parsing with Context Free Grammars - Features and Unification - Statistical parsing and probabilistic CFGs (PCFGs)-Lexicalized PCFGs.	
UNIT IV - SEMANTIC ANALYSIS	**(9)**
Representing Meaning – Semantic Analysis - Lexical semantics –Word-sense disambiguation - Supervised – Dictionary based and Unsupervised Approaches - Compositional semantics Semantic Role Labeling and Semantic Parsing – Discourse Analysis.	
UNIT V – APPLICATIONS	**(9)**
Named entity recognition and relation extraction- IE using sequence labeling-Machine Translation (MT) - Basic issues in MT-Statistical translation-word alignment- phrase-based translation – Question Answering.	
	TOTAL (L: 45) = 45 PERIODS

REFERENCES:

1. Daniel Jurafsky and James H. Martin Speech and Language Processing (2nd Edition), Prentice Hall; 2 edition, 2008.
2. Foundations of Statistical Natural Language Processing by Christopher D. Manning and Hinrich Schuetze, MIT Press, 1999.
3. Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009.
4. Roland R. Hausser, Foundations of Computational Linguistics: Human- C o m p u t e r Communication in Natural Language, Paperback, MIT Press, 2011.

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17RAO01 EMPLOYABILITY ENHANCEMENT AND ANALYTICAL SKILLS
(Common to 17CAO01 and 17EYZ04)

L	T	P	C
0	0	6	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To enable learners to achieve linguistic competence in oral and written discourse efficiently.	1.1	Write in an effective manner that demonstrates an understanding of the basic concepts of grammar.	f,i,j,l
2.0	To acquire necessary listening and speaking skills in order to comprehend discourse and to express effectively and exchange ideas.	2.1	Listen and comprehend lectures and communicate effectively in their area of Specialization and speak fluently.	f,i,j,l
3.0	To learn various active reading and writing strategies in order to comprehend, analyze and communicate ideas.	3.1	Read different genres of texts, infer implied meanings and write effectively for a variety of professional and social settings.	f,i,j,l
4.0	To develop students to workout solution for problems that involves mathematical aptitude.	4.1	Solve aptitude problems with ease.	f,i,j,l
5.0	To develop students to workout solutions for problems that involves general reasoning.	5.1	Solve reasoning problems with ease.	f,i,j,l

UNIT I – GRAMMAR	**(18)**
Parts of Speech – Synonyms & Antonyms - Primary Auxiliary Verbs – Modal Auxiliary Verbs - Tenses – Articles– Preposition – Conjunction–Common Errors - Subject Verb Agreement – Error Spotting – One word Substitution – Jumbled Sentences – Confusable word – Idioms and Phrases – Degrees of Comparison – Sentence Completion.	
UNIT II - LISTENING AND SPEAKING	**(18)**
LISTENING - Listening Strategies - Listening for Specific Information- Listening to TED & INK Talks - Listening for Signpost Language - Listening to Telephonic Conversations. SPEAKING - Group/Pair Presentations - Visume - Interview Skills – GD.	
UNIT III - READING AND WRITING	**(18)**
READING - Strategies for Effective Reading - Reading for Specific Information - Speed Reading Techniques - Critical Reading. WRITING - Job Application Letter with Resume - E-mail Writing - Paragraph Writing.	
UNIT IV – APTITUDE	**(18)**
Number System- Ratio & Proportion-Percentages-Averages-Profit & Loss.	
UNIT V – REASONING	**(18)**
Figure Series-Blood Relation-Analogy-Coding and Decoding-Odd one out.	
TOTAL (L: 0; P:90) = 90 PERIODS	

REFERENCES:

1. Tickoo, M. L., A. E. & Subramaniam, P. R.,"Intermediate Grammar Usage & Composition" Orient Blackswan, 1976.
2. Davis, Jason and Liss, Rhonda, "Effective Academic Writing (Level 3)" Oxford University Press, 2006.
3. Koneru, Aruna, "English Language Skills" Tata McGraw-Hill Education, 2011.
4. Raman, Meenakshi and Sharma, Sangeeta, "Technical Communication English Skills for Engineers" Oxford University Press, 2008.
5. Khattar, Dinesh, "Quantitative Aptitude", 3rd ed. New Delhi: Pearson, 2014.
6. Aggarwal R.S., "A Modern Approach to Verbal & Non Verbal Reasoning", Revised Edition, New Delhi: S.Chand Publishers, 2017.

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17RAX31 DATA SCIENCE TECHNIQUES

(Common to 17CAX29 & 17ITX27 Courses)

L	T	P	C
3	0	0	3

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	To Understand Data Science concepts and formulate the problems.	1.1	Students will be able to use metrics to analyze the predications for the problem.	a, b, c
2.0	To make the students to know how to handle the data.	2.1	Students will be able to extract the data using tools like SSIS, RPA.	a, b, c, k
3.0	To make the students understand how to explore the data.	3.1	Students will be able to explore and analyze the data.	b, c, j, k
4.0	To make the students to know about Machine Learning and IPython.	4.1	Students will be able to code IPython for manipulating data.	b, c, j, k
5.0	To apply visualization techniques to clearly communicate analytic insights to business sponsors, analytic audiences and use Tabluea.	5.1	Students will be able to apply tool like Tableau to visualize data.	b, c, j, k

UNIT I – INTRODUCTION	**(9)**
Introduction to Data Science – Need of Data Engineer - Basic Statistics - Data Types - Problem Definition – Classification - Regression: Linear and Logistics - Metrics to analyze the Prediction: Confusion matrix, Least Square, R^2.	
UNIT II - DATA HANDLING	**(9)**
Different Tools used to extract data from client server: SSIS, RPA - Sample server and domain information to get started with tools - Data Preparation: SQL, Python – Testing.	
UNIT III - DATA ANALYSIS	**(9)**
Exploratory Data Analysis - Exercises for EDA - Insights and Testing.	
UNIT IV - MACHINE LEARNING AND BIG DATA ANALYTICS	**(9)**
Introduction to ML – Python - Programming with IPython – Arrays - Data Frame – Grouping – Merging, Joining, Concatenate – Input and Output - Working with the Data – Testing - Analytics with Data Robot - Machine learning Tool.	
UNIT V – VISUALIZATION	**(9)**
Introduction to visualization Tools – Tabluea, Power BI, Kibana - Working with Tabluea – Import the data – Options – filtering – Calculative Field – Geographic representation – Graph – Histogram, Scatter plot, Gain chart – Workbook – Creating Story.	
TOTAL (L: 45) = 45 PERIODS	

REFERENCES:

1. Thomas. A. Runkler, "Data Analytics: Models and algorithms for Intelligent Data Analysis", Springer, Germany, 2012. (UNIT-I, II)
2. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing Ltd., UK, 2020.
3. Jared Dean, "Big Data, Data Mining and Machine Learning", Wiley Publication, 2014.

WEB REFERENCES:

1. https://www.tutorialspoint.com/machine_learning_with_python/machine_learning_with_python_jupyter_notebook.htm
2. https://www.tutorialspoint.com/tableau/index.htm

17RAC01 IT ESSENTIALS AND PC INSTALLATION (*Bridge Course-1 for Non-Computer Science Students*)					
		L	T	P	C
		2	0	0	0
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Programme Outcomes**	
1.0	To learn about the basics of computer.	**1.1**	Acquire moderate level of expertise in the knowledge of computer basics such as hardware, software, computer types and about computer security.	**b,c,k**	
2.0	To learn about basic understanding of Computer Programming constructs.	**2.1**	Acquire knowledge about decision making, looping statements and able to do simple programs.	**a,b,c**	
3.0	To learn about procedures of PC installation.	**3.1**	Acquire knowledge about booting, OS installation and driver installation.	**b,c,d**	

Basic Computer Terminology	**(10)**
Computer System - Programming Languages – Hardware and Software – Types of Computer – Generations of Computer - Computer Applications – Data Processing – Computer Networking – Electronic Commerce – Computer Security – Threat – Virus.	
Basics of Programming	**(10)**
Software Programming – Algorithm Flowchart – Simple C Programs using Control Flow: if...else, for loop, while loop, break and continue and switch...case.	
PC Installation	**(10)**
BIOS Settings: Boot from CD-ROM and USB – OS Installation – Hard disk partition – Installation of hardware drivers – Installation of Software.	
	TOTAL : 30 PERIODS

REFERENCES:

1. Kamthane, Ashok N, "Programming in C", Pearson Education, Second Edition, 2013.
2. B. Govindarajalu, "IBM PC Clones Hardware, Troubleshooting and Maintenance", Second Edition, TMH, 2002.
3. Scott Mueller, "Upgrading and Repairing PCs", Twenty Second Edition, 2016.
4. https://www.tutorialspoint.com/computer_fundamentals/index.htm

17RAC02 COMPUTER FUNDAMENTALS
(Bridge Course-2 for Non-Computer Science Students)

L	T	P	C
2	0	0	0

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program
1.0	To impart the knowledge about Computer architecture, various machine instruction of a computer, Input/ Output Devices and Addressing Modes.	1.1	Acquire knowledge about processor, Instruction sets, ALU, Input/ Output Devices and Addressing Modes.	a,b
2.0	To become familiar with the fundamental concepts of operating systems, Translators and various management responsibilities of operating system.	2.1	Become competent in recognizing operating systems features, issues and understands the functions of management of process, file, memory and I/O devices	b,c,d
3.0	To learn networking concepts, network architectures and routing devices.	3.1	Student will be able to acquire knowledge about OSI Model, Network topologies such as bus, ring, star and mesh, and routing devices such as repeaters, bridge, router and gateway.	b,c,g,i
4.0	To learn about Ms-Office software.	4.1	Able to create and work with the documents in word, excel, access and power point presentation.	a,b,c,f,j

FUNDAMENTALS OF COMPUTER ARCHITECTURE	**(5)**
Computer Organization – Instruction Execution - Input/ Output Devices – CPU Performance – Addressing Modes.	
SYSTEM SOFTWARE AND OPERATING SYSTEM	**(10)**
System software versus Application software – Translators - Loaders and Linkers – Linking – Compilers – Interpreters – Memory Management – Process Management – File System Management – Device Management.	
COMPUTER NETWORKS	**(5)**
Motivation – Need for Computer Networks – Network Topology – The OSI Model - Routing Devices – Types of Networks.	
OFFICE AUTOMATION	**(10)**
MS- Word – Ms-Excel – MS- Access – MS-Power Point Presentation.	
	TOTAL = 30 PERIODS

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Tata McGraw Hill, Fifth Edition, 2002.
2. Abraham Silberschatz Peter B. Galvin, G. Gagne, "Operating System Concepts", Eighth Edition, Addison Wesley Publishing Co., 2010.
3. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw-Hill, 2013.
4. John Walkenbach et.al, "Microsoft Office 2007 Bible", Wiley India Edition, 2007.

17RAC03 WEB DESIGN ESSENTIALS *(Bridge Course-3 for Non-Computer Science Students)*				
L	T	P	C
2	0	0	0

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Programme Outcomes
1.0	To learn about HTML Basics and its tags	1.1	Able to create own web pages using HTML Tags.	a,c
2.0	To learn about tags to display data and Navigation tags.	2.1	Able to create web pages with table of data, list of data and tags to navigate from one page to another.	a,b,c
3.0	To learn about different layouts and CSS.	3.1	Acquire knowledge to design web pages with frames, layouts, forms and CSS.	a,b,c

HTML Basics	**(10)**
Overview – Basic tags – Elements – Attributes – Formatting – Phrase Tags – Meta Tags – Comments.	
Visual Presentation of data and Webpage Navigation	**(10)**
Backgrounds – Colors – Fonts – Images – Tables – Lists – Text Links – Image Links – Email Links – Marquees.	
Webpage Partition and User Interaction	**(10)**
Frames – Layout - Forms – Introduction to Cascading Style Sheets.	
	TOTAL = 30 PERIODS

REFERENCES:

1. Jon Duckett "Beginning Web Programming with HTML, XHTML and CSS", Second Edition, Wiley Indian Pvt. Ltd, 2012.
2. https://www.tutorialspoint.com/html/index.htm

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17RAC04 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE *(Bridge Course-4 for Non-Computer Science Students)*				
L	T	P	C
2	0	0	0

PREREQUISITE: NIL

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Programme Outcomes
1.0	Be exposed to concepts and properties of set theory	1.1	Show mathematical reasoning and arrive at conclusions about sets	a,b
2.0	To understand the basic concepts of logic and their applications	2.1	Infer whether a logical argument is valid from the given set of premises by applying the inference rules of Propositions.	a,b,c
3.0	To learn the foundations of automata theory, computability theory and complexity theory.	3.1	Acquire concepts relating to the theory of computation and computational models.	a,b,c

BASIC SET THEORY	**(6+4)**
Basic Definitions - Venn Diagrams and Set operations - Laws of set theory - Principle of inclusion and exclusion.	
MATHEMATICAL LOGIC	**(6+4)**
Propositions and logical operators - Truth table - Propositions generated by a Set, Equivalence and Implication - Basic laws- Some more connectives – Functionally complete set of connectives- Normal forms.	
FORMAL LANGUAGE & FINITE STATE AUTOMATA	**(6+4)**
Languages and Grammars - Phrase Structure Grammar - Classification of Grammars - Pumping Lemma for Regular Languages - Context Free Languages. Finite State Automata-Deterministic Finite State Automata (DFA), Non Deterministic Finite State Automata (NFA).	
	TOTAL = 30 PERIODS

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, Fourth Edition, 2002.
2. Hopcroft and Ullman, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.