ANNAMALAI UNIVERSITY

213. Bachelor of Computer Applications (B.C.A)

Programme Structure and Scheme of Examination (under CBCS)
(Applicable to the candidates admitted from the academic year 2023 -2024 onwards)

Course Code	Part	Study Components & Course Title	Credit	Hours/Week	Maximum Marks		
					CIA	ESE	Total
		SEMESTER – I					
23UTAML11/ 23UHINL11/ 23UFREL11	I	Language– I பொது தமிழ்-I: தமிழிலக்கிய வரலாறு-1/ Hindi-I/ French-I	3	6	25	75	100
23UENGL12	II	General English – I	3	6	25	75	100
23UBCAC13	III	Core – I- Python Programming	5	5	25	75	100
23UBCAP14		Core –II - Python Programming Lab	5	5	25	75	100
23UNUME15 23USMAE15		Elective – I: Numerical Methods (or) Statistical Methods and its Application-I	3	4	25	75	100
23UTAMB16 23UTAMA16	IV	Skill Enhancement Course – I* NME-I / Basic Tamil – I / Advanced Tamil - I	2	2	25	75	100
23UBCAF17		Foundation Course: Structured Programming in C	2	2	25	75	100
		Total	**23**	**30**			**700**
		SEMESTER – II					
23UTAML21/ 23UHINL21/ 23UFREL21	I	Language– II பொது தமிழ் -II: தமிழிலக்கிய வரலாறு-2/ Hindi-II/ French-II	3	6	25	75	100
23UENGL22	II	General English – II	3	6	25	75	100
23UBCAC23	III	Core – III- Object Oriented Programming Concepts Using C++	5	5	25	75	100
23UBCAP24		Core –IV: C++ Programming Lab	5	5	25	75	100
23URMTE25 23USMAE25		Elective – II: Resource Management Techniques (or) Statistical Methods and its Applications-II	3	4	25	75	100
23UTAMB26 23UTAMA26	IV	Skill Enhancement Course – II* NME-II / Basic Tamil – II / Advanced Tamil – II	2	2	25	75	100
23USECG27		Skill Enhancement Course – III: Internet and its Applications (Common Paper)	2	2	25	75	100
23UNMSD01		Language Proficiency for employability: Overview of English Communication**	2	-	25	75	100
		Total	**25**	**30**			**800**

		SEMESTER – III					
23UTAML31/ 23UHINL31/ 23UFREL31	I	Language– III பொது தமிழ் -III: தமிழக வரலாறும், பண்பாடும்/ Hindi-III/ French-III	3	6	25	75	100
23UENGL32	II	General English – III	3	6	25	75	100
23UBCAC33	III	Core – V- Data Structures and Algorithms	5	5	25	75	100
23UBCAP34		Core –VI: Data Structures and Algorithms Lab	5	4	25	75	100
23UBCAE35		Elective – III: Financial Accounting	3	4	25	75	100
23UBCAS36	IV	Skill Enhancement Course – IV: Enterprise Resource Planning	1	2	25	75	100
23UBCAS37		Skill Enhancement Course – V: Advanced Excel	2	2	25	75	100
		Environmental Studies	-	1	-	-	-
		Total	**22**	**30**			**700**
		SEMESTER – IV					
23UTAML41/ 23UHINL41/ 23UFREL41	I	Language– IV பொது தமிழ்-IV: **தமிழும் அறிவியலும்** / Hindi-IV/ French-IV	3	6	25	75	100
23UENGL42	II	General English – IV	3	6	25	75	100
23UBCAC43	III	Core – VII - Programming in Java	5	5	25	75	100
23UBCAP44		Core –VIII: Programming in Java Lab	5	4	25	75	100
23UBCAE45		Elective – IV: Cost and Management Accounting	3	4	25	75	100
23UBCAS46	IV	Skill Enhancement Course – VI: Web Designing	2	2	25	75	100
23UBCAS47		Skill Enhancement Course – VII: PHP Programming	2	2	25	75	100
23UEVSG48		Environmental Studies	2	1	25	75	100
		Total	**25**	**30**			**800**

		SEMESTER – V					
23UBCAC51	III	Core-IX: Operating System	4	5	25	75	100
23UBCAC52		Core-X: ASP .Net Programming	4	5	25	75	100
23UBCAP53		Core – XI: ASP. Net Programming Lab	4	5	25	75	100
23UBCAD54		Core –XII: Project with Viva-voce	4	5	25	75	100
23UBCAE55-1 23UBCAE55-2		Elective – V: Database Management System Introduction to Data Science	3	4	25	75	100
23UBCAE56-1 23UBCAE56-2		Elective – VI: Software Engineering Data Mining and Warehousing	3	4	25	75	100
23UVALG57	IV	Value Education	2	2	25	75	100
23UBCAI58		Summer Internship [++]	2	-	25	75	100
		Total	**26**	**30**			**700**
		SEMESTER – VI					
23UBCAC61	III	Core-XIII- Computer Networks	4	6	25	75	100
23UBCAC62		Core-XIV- Data Analytics using R Programming	4	6	25	75	100
23UBCAP63		Core-XV- R Programming Lab	4	6	25	75	100
23UBCAE64-1 23UBCAE64-2		Elective-VII: Artificial Intelligence Cloud computing	3	5	25	75	100
23UBCAE65-1 23UBCAE65-2		Elective-VIII: Software Project Management Cryptography	3	5	25	75	100
23UBCAF66	IV	Professional Competency Skill: Big Data Analytics	1	2	25	75	100
23UBCAX67	V	Extension Activity	2	-	25	75	100
		Total	**21**	**30**			**700**
		Grand Total	**142**				**4400**

Non-major (NME) Electives offered to other Departments

23UBCAN16	IV	Introduction to HTML	2	2	25	75	100
23UBCAN26	IV	Multimedia Systems	2	2	25	75	100

* PART-IV: NME / Basic Tamil / Advanced Tamil (Any one)
Students who have not studied Tamil upto 12th Standard and have taken any Language other than Tamil in Part-I, must choose Basic Tamil-I in First Semester & Basic Tamil-II in Second Semester.
Students who have studied Tamil upto 10th & 12th Standard and have taken any Language other than Tamil in Part-I, must choose Advanced Tamil-I in First Semester and Advanced Tamil-II in Second Semester.

** The course "23UNMSD01: Overview of English Communication" is to be taught by the experts from Naan Mudhalvan Scheme team. However, the faculty members of Department of English should coordinate with the Naan Mudhalvan Scheme team for smooth conduct of this course.

[++]Students should complete two weeks of internship before the commencement of V semester.

Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System
for all UG courses including Lab Hours

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course SEC-1 (NME-I)	2	2
	Foundation Course	2	2
		23	**30**

Semester-II

Part	List of Courses	Credit	No. of Hours
Part I	Language – Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-2 (NME-II)	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	**30**

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	14
Part IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	**30**

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part I	Language - Tamil	3	6
Part II	English	3	6
Part III	Core Theory, Practical & Elective Courses	13	13
Part IV	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	**30**

Third Year

Semester-V

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical, Project & Elective Courses	22	28
Part IV	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	-
		26	**30**

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part III	Core Theory, Practical & Elective Courses	18	28
Part IV	Professional Competency Skill	2	2
Part V	Extension Activity	1	-
		21	**30**

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	13	13	13	13	22	18	92
Part IV	4	4	3	6	4	2	23
Part V	-	-	-	-	-	1	1
Total	23	23	22	25	26	21	**140**

***Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components Part IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

CREDIT DISTRIBUTION FOR U.G. PROGRAMME

Part	Course Details	No. of Courses	Credit per course	Total Credits
Part I	Tamil	4	3	12
Part II	English	4	3	12
Part III	Core Courses	15	4/5	68
	Elective Courses: Generic / Discipline Specific (3 or 2+1 Credits)	8	3	24
Part I, II and III Credits				116
Part IV	Skill Enhancement Courses / NME / Language Courses	7	1/2	15
	Professional Competency Skill Course	1	2	2
	Environmental Science (EVS)	1	2	2
	Value Education	1	2	2
	Internship	1	2	2
Part IV Credits				**23**
Part V	Extension Activity (NSS / NCC / Physical Education)	1	1	1
Total Credits for the UG Programme				**140**

Methods of Evaluation		
Internal Evaluation	Continuous Internal Assessment Test	25 Marks
	Assignments	
	Seminars	
	Attendance and Class Participation	
External Evaluation	End Semester Examination	75 Marks
	Total	100 Marks
Methods of Assessment		
Recall (K1)	Simple definitions, MCQ, Recall steps, Concept definitions	
Understand/Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview	
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain	
Analyze(K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate between various ideas, Map knowledge	
Evaluate(K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons	
Create(K6)	Check knowledge in specific or off beat situations, Discussion, Debating or Presentations	

Programme Outcomes (PO) of BCA

1. Scientific aptitude will be developed in Students
2. Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
3. Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
4. Students will possess basic subject knowledge required for higher studies, professional and applied courses.
5. Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
6. Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
7. The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
8. Utilize computer programming skills tosolvetheoreticalandappliedproblemsbycriticalunderstanding,analysisandsynthesis.
9. Torecognizepatternsandtoidentifyessentialandrelevantaspectsofproblems.
10. Abilitytoshareideasandinsightswhileseekingandbenefittingfromknowledgeandinsightofothers.
11. Mouldthestudentsintoresponsiblecitizensinarapidlychanginginterdependent society.
12. Theaboveexpectationsgenerallycanbepooledinto6 broad categories and can be modified according to institutional requirements:

    PO1:Knowledge

    PO2:ProblemAnalysis

    PO3:Design/Development of Solutions

    PO4:ConductinvestigationsofcomplexproblemsPO5:Modern toolusage

    PO6:Applyingtosociety

ProgrammeSpecificOutcomesofB.Sc.DegreeProgrammeinComputerScience

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and realtime application related sciences.

PSO3:Knowwhen there is a need for information, to be able to identify, locate, evaluate,andeffectivelyusethatinformationfortheissueorproblemathand.

PSO4:Understand,formulate,developprogrammingmodelwith logical approaches to a Addressissuesarisinginsocialscience,businessandothercontexts.

PSO5:Acquiregoodknowledgeand understanding tosolvespecific theoretical and appliedproblemsinadvancedareasofComputerscienceandIndustrial statistics.

PO6:Providestudents/learnerssufficientknowledgeandskillsenabling them to undertakefurther studies in Computer Science or Applications or Information Technology and itsalliedareasonmultipledisciplineslinkedwithComputerScience.

PO7:EquipwithComputerscience technical ability, problem solving skills, creative talentandpowerofcommunicationnecessaryforvariousformsofemployment.

PO8:Developarange of generic skills helpful in employment, internships & societal activities.

PO9:Getadequateexposuretoglobalandlocal concerns that provides platform for furtherexplorationintomulti-dimensionalaspectsofcomputingsciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:
(put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1						
PO2						
PO3						
PO4						
PO5						
PO6						

SEMESTER:I PART: III	CORE-I : 23UBCAC13 : PYTHON PROGRAMMING	CREDIT:5 HOURS:5/W

COURSE OBJECTIVES

1. To make students understand the concepts of Python programming
2. To apply the OOPs concept in PYTHON programming
3. To impart knowledge on demand and supply concepts
4. To make the students learn best practices in PYTHON programming
5. To know the costs and profit maximization

UNIT I : **Basics of Python Programming** **Hours:15**

History of Python-Features of Python-Literal-Constants-Variables - Identifiers– Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods**.**

UNIT II:Control Statements **Hours:15**

Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements

.

UNIT III:Functions **Hours:15**

Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.

UNIT IV:Lists **Hours:15**

Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples– Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions and Methods - Difference between Lists and Dictionaries

UNIT V:Python File Handling **Hours:15**

Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files**.**

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Learn the basics of python, Do simple programs on python,

Learn how to use an array.

2. Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.
3. Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.
4. Work with List, tuples and dictionary, Write program using list, tuples and dictionary.
5. Usage of File handlings in python, Concept of reading and writing files, Do programs using files.

Text Books (In API Style)

1. ReemaThareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press.
2. Dr. R. NageswaraRao, "Core Python Programming", First Edition, 2017, Dream tech Publishers

Supplementary Readings

1. VamsiKurama, "Python Programming: A Modern Approach", Pearson Education.
2. Mark Lutz, "Learning Python", Orielly.
3. Adam Stewarts, "Python Programming", Online.
4. Fabio Nelli, "Python Data Analytics", APress
5. Kenneth A. Lambert, "Fundamentals of Python – First Programs", CENGAGE Publication.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**3**	**2**	**2**	**3**	**3**	**3**
CO 2	**3**	**2**	**2**	**3**	**2**	**3**
CO 3	**3**	**2**	**2**	**3**	**2**	**2**
CO 4	**3**	**2**	**2**	**3**	**2**	**3**
CO 5	**3**	**2**	**2**	**3**	**3**	**3**
Weightage of course contributed to each PSO	15	10	10	15	13	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:I PART: III	CORE-II: 23UBCAP14: PYTHON PROGRAMMING LAB	CREDIT: 5 HOURS: 5/W

COURSE OBJECTIVES

1. Be able to design and program Python applications.
2. Be able to create loops and decision statements in Python.
3. Be able to work with functions and pass arguments in Python.
4. Be able to build and package Python modules for reusability.
5. Be able to read and write files in python.

LIST OF EXPERIMENTS

1. Program using variables, constants, I/O statements in Python.
2. Program using Operators in Python.
3. Program using Conditional Statements.
4. Program using Loops.
5. Program using Jump Statements.
6. Program using Functions.
7. Program using Recursion.
8. Program using Arrays.
9. Program using Strings.
10. Program using Modules.
11. Program using Lists.
12. Program using Tuples.
13. Program using Dictionaries.
14. Program for File Handling

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Demonstrate the understanding of syntax and semantics
2. Identify the problem and solve using PYTHON programming techniques.
3. Identify suitable programming constructs for problem solving.
4. Analyze various concepts of PYTHON language to solve the problem in an efficient way.
5. Develop a PYTHON program for a given problem and test for its correctness.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**2**	**2**	**2**	**2**	**3**	**2**
CO 2	**2**	**1**	**3**	**2**	**-**	**2**
CO 3	**3**	**3**	**1**	**1**	**1**	**2**
CO 4	**2**	**3**	**3**	**1**	**-**	**1**
CO 5	**3**	**2**	**3**	**1**	**1**	**-**
Weightage of course contributed to each PSO	12	11	12	7	5	7

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER :I PART: III	23UNUME15: NUMERICAL METHODS	CREDIT : 3 HOURS : 4/W

OBJECTIVE:
The course aims to introduce the concepts of Finite differences, Central differences, Interpolation for unequal intervals, Inverse interpolation and Solutions of simultaneous linear equations.

COURSE OUTCOME:
The students after undergoing this course will be able to
CO1: develop the skill of calculation through forward and backward interpolations
CO2: solve by central difference methods
CO3: calculate interpolation for unequal intervals
CO4: solve the solutions of simultaneous equations using different methods.
CO5: understand the applications of integration in real life situation

UNIT- I: FINITE DIFFERENCES
First and higher order differences-forward differences and Back ward differences-Properties of operators-Differences of a Polynomial-Factorial Polynomials – Operator E, Relation between Δ, ∇ and E – Interpolation – Newton – Gregory forward & backward formulae for interpolation – Estimating the Missing terms (No derivations of formulae, simple problems only).

UNIT-II: CENTRAL DIFFERENCES
Central difference Operators – Central differences formulae: Gauss Forward and Backward formulae – Sterling's formula – Bessel's formula (No derivations of formulae, simple problems only).

UNIT – III: INTERPOLATION FOR UN-EQUAL INTERVALS AND INVERSE INTERPOLATION
Divided differences – Newton's divided differences formula and Lagrange's formula [without proof] – Inverse Lagrange's interpolation.

UNIT – IV: SOLUTION OF SIMULTANEOUS EQUATION
Gauss Elimination method – Gauss Jordan Method,-Gauss Seidal method – Crout's method [Three unknowns only].

UNIT – V: NUMERICAL DIFFERENTIAL EQUATIONS AND INTEGRATION
Euler's method, Euler's modified method, solving First order differential equation using Runge kutta method.

TEXT BOOK:

A. Singaravelu [New Edition June - 2001], "Numerical Methods", Meenakshi Agency, Chennai.

Unit- I: Chapter: 3 Section 3.1-3.5,3.12-3.18 Pages – (3.1- 3.22,3.39-3.55).
Unit- II:Chapter: 3 Section 3.6-3.10 - Pages – (3. 23 – 3. 32, 3.36 - 3.38).
Unit –III: Chapter: 4- Pages – (4.1 – 4.16).
Unit –IV:Chapter: 2 - Pages – (2.39 – 2.71).
Unit -V:Chapter: 4,5 Section 2,3 - Pages – (4. 29 – 4.32, 4.36-4.44 , 5.12 – 5.15, 5.18 - 5.32).

REFERENCE BOOKS :

1. S.Arumugham (2003), "Numerical Methods", New Gamma Publishing, Palayamkottai.
2. H.C.Saxena (1991), "Finite differences and Numerical Analysis", S.Chand & Co. Delhi
3. B.D.Gupta (2001), "Numerical Analysis", Konark Pub. Ltd., Delhi
4. P.Kandasamy, K.Thilagavathy (2003), "Calculus of Finite difference & Numerical Analysis", S.Chand & Company Ltd., New Delhi-55.

SEMESTER :I PART: III	ELECTIVE-I: PAPER-2 23USMAE15: STATISTICAL METHODS AND ITS APPLICATION - I	CREDIT : 3 HOURS : 4

COURSE OUTCOME:

1: develop the skill of statistical methods and its representations.
2: solve by mean ,median and mode
3: calculate range, deviation and its measures.
4: solve the skewness and its coefficients.
5: understand the correlation and regression analysis.

UNIT–I: INTRODUCTION **Hours: 12**

Scope and limitations of statistical methods - classification of data -Tabulation of data - Diagrammatic and Graphical representation of data - Graphical determination of Quartiles ,Deciles and Percentiles.

UNIT-II: **MEASURES OF LOCATION** **Hours: 12**

Arithmetic mean, median, mode, geometric mean and Harmonic mean and their properties**.**

UNIT –III: MEASURES OF DISPERSION **Hours: 12**

Measures of dispersion: Range, Quartile deviation, mean deviation, Standard deviation,combined Standard deviation, and their relative measures.

UNIT –IV: MEASURES OF SKEWNESS **Hours: 12**

Measures of Skewness Karl Pearson's, Bowley's, and kelly's and co-efficient of Skewness and kurtosis based on moments.

UNIT –V: CORRELATION **Hours: 12**

Correlation - Karl Pearson - Spearman's Rank correlation – concurrent deviation methods.
Regression Analysis: Simple Regression Equations.

TEXT BOOK:

1.Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand

SUPPLEMENTARY READINGS:

1.Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII

2. Elements of Statistics - Mode . E.B. - Prentice Hall

3. Statistical Methods - Dr. S.P. Gupta - Sultan Chand & Sons

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	1	2	2	3	1
CO3	3	3	3	2	2
CO4	1	2	3	2	2
CO5	1	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:I PART: IV	SKILL ENHANCEMENT COURSE-I (FOUNDATION COURSE) **23UBCAF17 : STRUCTURED PROGRAMMING IN C**	**CREDIT:2** **HOURS:2/W**

COURSE OBJECTIVES

1. To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations
2. To understand the concept using if statements and loops
3. This unit covers the concept of Arrays
4. This unit covers the concept of Functions
5. To understand the concept of implementing pointers.

UNIT I :**Overview of C**
Hours:6

Importance of C, sample C program, C program structure, executing C program.
Constants, Variables, and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration of variables, Assigning values to variables--- Assignment statement, declaring a variable as constant, as volatile. Operators and Expression

UNIT II: Decision Making and Branching
Hours:6

Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement.**Decision Making and Looping**: While, Do-While, For, Jumps in loops.

UNIT III: Arrays
Hours:6

Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays**.**

UNIT IV: Functions
Hours:6

The form of C functions, Return values and types, calling a function, categories of functions, Nested functions, Recursion, functions with arrays, call by value, call by reference, storage classes-character arrays and string functions

UNIT V: Pointers
Hours:6

Definition, declaring and initializing pointers, accessing a variable through address and through pointer, pointer expressions, pointer increments and scale factor, pointers and arrays, pointers and functions, pointers and structures.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Remember the program structure of C with its syntax and semantics
2. Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)
3. Apply the programming principles learnt in real-time problems
4. Analyze the various methods of solving a problem and choose the best method
5. Code, debug and test the programs with appropriate test cases

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Text Books (In API Style)

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010"

Supplementary Readings

2. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw- Hill, 2018.

3. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998

4. YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**1**	**2**	**2**	**2**	**2**	**-**
CO 2	**2**	**2**	**2**	**2**	**-**	**2**
CO 3	**3**	**2**	**2**	**1**	**1**	**-**
CO 4	**3**	**2**	**2**	**1**	**-**	**1**
CO 5	**1**	**2**	**2**	**2**	**2**	**3**
Weightage of course contributed to each PSO	7	10	10	18	15	6

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:II PART: III	CORE-III: 23UBCAC23 : OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++	CREDIT:5 HOURS:5/W

COURSE OBJECTIVES

1. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
2. Understand dynamic memory management techniques using pointers, constructors, destructors, etc
3. Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
4. Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
5. Demonstrate the use of various OOPs concepts with the help of programs.

UNIT I :Introduction to C++ **Hours:15**

key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Making and Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – FunctionOverloading.

UNIT II:Classes and Objects **Hours:15**

.Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.

UNIT III: Operator Overloading **Hours:15**

Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal,Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.

UNIT IV: Pointers **Hours:15**

Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes andBase classes – Arrays – Characteristics – array of classes – Memory models – new and deleteoperators – dynamic object – Binding, Polymorphism and Virtual Functions.

UNIT V: Files **Hours:15**

File stream classes – file modes – Sequential Read / Write operations – Binary and ASCIIFiles – Random Access Operation – Templates – Exception Handling - String – Declaring andInitializing string objects – String Attributes – Miscellaneous functions .

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1.Remember the program structure of C with its syntax and semantics

2. Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)

3. Apply the programming principles learnt in real-time problems

4. Analyze the various methods of solving a problem and choose the best method

5. Code, debug and test the programs with appropriate test cases

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Text Books (In API Style)

1 E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

Supplementary Readings

1. Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++",Pearson Education 2003.
2. Maria Litvin& Gray Litvin, "C++ for you", Vikas publication 2002.

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	2	1	-	-	1
CO 2	2	2	2	1	-	-
CO 3	3	1	1	-	1	-
CO 4	1	2	1	2	2	1
CO 5	3	2	1	2	3	2
Weightage of course contributed to each PSO	12	9	6	5	6	4

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:II PART: III	CORE-IV: 23UBCAP24: C++ PROGRAMMING LAB	CREDIT: 5 HOURS: 5/W

COURSE OBJECTIVES

1. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
2. Understand dynamic memory management techniques using pointers, constructors, destructors, etc
3. Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
4. Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
5. Demonstrate the use of various OOPs concepts with the help of programs

LIST OF EXPERIMENTS

1. Write a C++ program to demonstrate function overloading, Default Arguments and Inline function.
2. Write a C++ program to demonstrate Class and Objects
3. Write a C++ program to demonstrate the concept of Passing Objects to Functions
4. Write a C++ program to demonstrate the Friend Functions.
5. Write a C++ program to demonstrate the concept of Passing Objects to Functions
6. Write a C++ program to demonstrate Constructor and Destructor
7. Write a C++ program to demonstrate Unary Operator Overloading
8. Write a C++ program to demonstrate Binary Operator Overloading
9. Write a C++ program to demonstrate:
    - Single Inheritance
    - Multilevel Inheritance
    - Multiple Inheritance
    - Hierarchical Inheritance
    - Hybrid Inheritance
10. Write a C++ program to demonstrate Virtual Functions.
11. Write a C++ program to manipulate a Text File.
12. Write a C++ program to perform Sequential I/O Operations on a file.
13. Write a C++ program to find the Biggest Number using Command Line Arguments
14. Write a C++ program to demonstrate Class Template
15. Write a C++ program to demonstrate Function Template
16. Write a C++ program to demonstrate Exception Handling

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Remember the program structure of C with its syntax and semantics
2. Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)
3. Apply the programming principles learnt in real-time problems
4. Analyze the various methods of solving a problem and choose the best method
5. Code, debug and test the programs with appropriate test cases

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**3**	**3**	**3**	**3**	**1**	**2**
CO 2	**2**	**3**	**3**	**3**	**1**	**2**
CO 3	**2**	**3**	**3**	**3**	**1**	**2**
CO 4	**2**	**3**	**3**	**3**	**1**	**2**
CO 5	**2**	**3**	**3**	**3**	**1**	**2**
Weightage of course contributed to each PSO	11	15	15	15	5	10

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:II PART:III	23URMTE25 : RESOURCE MANAGEMENT TECHNIQUES	CREDIT:3 HOURS:4/W

OBJECTIVE:
The course aims to introduce linear programming, transportation methods, assignment models, sequencing problem, game theory and network analysis in project planning.

COURSE OUTCOME:
The students after undergoing this course will be able to
CO1: use knowledge of operational research in LPP.
CO2: understand analogies between transportation problem, phenomena in operational Research.
CO3: formulate physical problems as operational research using assignment models
CO4: classify operational research, game theory, interpret the solutions.
CO5: interpret solutions in network analysis.

UNIT - I : LINEAR PROGRAMMING
Definitions of OR - formulations of Linear programming problem - Graphical methods of solution - The simplex method - Artificial variables techniques - The Big-M method.

UNIT - II : TRANSPORTATION MODELS
Definitions of the transportation model - Formulation and solution of transportation models - North-west corner rule - Least cost method - Vogel's approximation method - Solution of transportation - MODI method.

UNIT - III : ASSIGNMENT MODELS
Definition of Assignment models - Mathematical representation of assignment model- Solution of the assignment model - The Hungarian methods for solution of the assignment models –unbalanced assignment problem.
SEQUENCING PROBLEM
Sequencing problems – Johnson’s Algorithm- processing 'n' jobs through two machines - processing 'n' jobs through three machines - processing two jobs through 'm' machines .

UNIT - IV : GAME THEORY
Definitions - Rules for game theory - Rule 1 look for a pure strategy - Rule 2 reduce game by dominance - Rule 3 Solve for mixed strategy - Mixed strategies (2x2 games) - Mixed strategies (2xn games & mx2 games) - mixed strategies (3x3 or higher games).

UNIT - V : NETWORK ANALYSIS
Basic tools and techniques of project managements - Network logic - Numbering the events - Activity on node diagram - Critical path method - Program evaluation and review technique [PERT].

TEXT BOOK:

1. Prem Kumar Gupta, D.S. Hira [2008], "Operation Research", S. Chand & Company Ltd, Re Print 2010, New Delhi.
   Unit-I: Chapters: 1&2 –1: 1.2,2: 2.2, 2.3, 2.10, 2.11: 2.11.1, 2.11.2
   (Pg: 4 to 5, 37 to 97,141 to 165)
   Unit-II: Chapter 3: 3.1 to 3.4 (Pg: 212 to 248)
   Unit-III: Chapters 4 &5: 4: 4.1-4.6, 5: 5.1, 5.4-5.7
   (Pg: 306 to 334 , 381 to 382 & 387 to 408)
   Unit-IV: Chapter 8: 8.4: 8.4.2 – 8.4.8(Pg: 692 to 724)
   Unit-V: Chapter 14: 14.1 to 14.9(Pg: 1001 to 1050)

REFERENCE BOOKS:

1. Operation Research", Dr.S.J.Venkatesan, [2012], Sri Krishna Publications, Chennai.
2. Taha H. A.[2003], "Operations Research" , Macmillan Publishing Company, New York
3. J. K. Sharma, [2001], "Operations Research Theory and Applications", Macmillan, Delhi
4. P.R. Vittal [2003], "Operations Research" , Margham Publications, Chennai.

SEMESTER:II PART:III	23USMAE25 : STATISTICAL METHODS AND ITS APPLICATIONS-II	CREDIT:3 HOURS:4/W

COURSE OBJECTIVES

To understand and computing statistical Methods by which to develop the programmingSkills.

UNIT I

Curve fitting by the methods of least squares -

$Y = ax + b$, $Y = ax^2 + bx + c$, $Y = ax^b$, $Y = ae^{bx}$ and $Y = ab^x$.

UNIT II

Sample Space - events - probability - Addition and Multiplication Theorem - conditional probability - Baye's Theorem. Mathematical expectation Addition and Multiplication theorem.

UNIT III

Standard distributions - Binomial, Poisson, Normal distribution and fitting of these distributions.

UNIT IV

Test of Significance- small sample and large sample test based on mean, S.D. correlationand proportion - confidence interval.

UNIT V

Analysis of variance - One and Two way classifications - Basic principle of design of Experiments - Randomisation, Replication and Local control - C.R.D., R.B.D. and L.S.D.

Text Books

1. Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor – S. Chand & Co.

Supplementary Readings

1. Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor – S. Chand & Co.
2. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII Elements of Statistics - Mode . E.B. – Prentice Hall

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	2
CO2	1	3	2	2	3
CO3	3	3	3	2	2
CO4	3	3	2	2	2
CO5	1	3	3	3	3

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:I	SKILL ENHANCEMENT COURSES-1 (NME-1)	CREDIT:2
PART: IV	23UBCAN16 : INTRODUCTION TO HTML	HOURS:2/W

COURSE OBJECTIVES

1. Insert a graphic within a web page
2. Create a link within a web page.
3. Create a table within a web page
4. Insert heading levels within a web page.
5. Insert ordered and unordered lists within a web page. Create a web page.

UNIT I : **Introduction** **Hours:6**

Web Basics: What is Internet – Web browsers–What is Web page
HTML Basics:Understanding tags.

UNIT II : Tag Structure **Hours:6**

Tags for Document structure (HTML, Head, Body Tag).Block level text elements: Headings paragraph (<p> tag)–Font style elements:(bold, italic, font, small, strong, strike, big tags).

UNIT III : Lists **Hours:6**

Types of lists:Ordered, Unordered – Nesting Lists–Other tags: Marquee, HR, BR-Using Images –Creating Hyperlinks.

UNIT IV: Tables **Hours:6**

Creating basic Table, Table elements, Caption–Table and cell alignment–Rowspan ,Colspan–Cell padding

UNIT V : Frames **Hours:6**

Frames: Frameset–Targeted Links–No frame–Forms:Input, Text area, Select, Option.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1 .Knows the basic concept in HTMLConcept of resources in HTML
2. Knows Design concept Concept of Meta DataUnderstand the concept of save the files.
3.Understand the page formatting Concept of list
4. Creating Links.Know the concept of creating link to email address
5. Concept of adding imagesUnderstand the table creation.

Text Books

1. "Mastering HTML5 and CSS3 Made Easy", TeachUComp Inc., 2014.Dr. R. NageswaraRao, "Core Python Programming", First Edition, 2017, Dream tech Publishers
2. Thomas Michaud, "Foundations of Web Design: Introduction to HTML & CSS"

Supplementary Readings

1.https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf.

2.https://www.w3schools.com/html/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
Weightage of course contributed to each PSO	14	15	14	14	15	15

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:II	SKILL ENHANCEMENT COURSES-2 (NME-II)	CREDIT:2
PART: IV	23UBCAN26 : MULTIMEDIA SYSTEMS	HOURS:2/W

COURSE OBJECTIVES

1. Understand the definition of Multimedia
2. To study about the Image File Formats, SoundsAudio File Formats
3. Understand the concepts of Animation and Digital Video Containers
4. To study about the Stage of Multimedia Project
5. Understand the concept of Ownership of Content Created for Project Acquir Talent

UNIT I : **Multimedia Definition** **Hours:6**

Use Of Multimedia-Delivering Multimedia- Text:About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and DesignTools-HypermediaandHypertext.

UNIT II:Images **Hours:6**

Plan Approach - Organize Tools - Configure Computer Workspace -Making Still Images - Color - Image File Formats. Sound: The Power of Sound -DigitalAudio-MidiAudio-Midivs.DigitalAudio-MultimediaSystemSoundsAudio File Formats -Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.

UNIT III:Animation **Hours:6**

The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays-DigitalVideoContainers-ObtainingVideo Clips -ShootingandEditingVideo

UNIT IV:Making Multimedia **Hours:6**

The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.

UNIT V:PlanningandCosting **Hours:6**

TheProcessofMakingMultimedia-Scheduling-Estimating - RFPs and Bid Proposals. Designing and Producing - Content andTalent:AcquiringContent-OwnershipofContentCreatedforProject-AcquiringTalent

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. understand the concepts, importance, application and the process of developing multimedia
2. to have basic knowledge and understanding about image related processings
3. To understand the framework of frames and bit images to animations
4. Speaks about the multimedia projects and stages of requirement in phases of project.
5. Understanding the concept of cost involved in multimedia planning, designing, and producing

Text Books (In API Style)

1.TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001. “

Supplementary Readings

1. RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**3**	**2**	**3**	**3**	**2**	**1**
CO 2	**3**	**2**	**3**	**3**	**2**	**1**
CO 3	**3**	**2**	**3**	**3**	**2**	**1**
CO 4	**3**	**2**	**3**	**3**	**1**	**1**
CO 5	**3**	**3**	**3**	**3**	**1**	**1**
Weightage of course contributed to each PSO	15	11	15	15	8	5

S-Strong-3 M-Medium-2 L-Low-1

SUPPLEMENTARY READINGS:

1.Fundamental of Mathematical Statistics - S.C. Gupta & V.K. Kapoor - Sultan Chand

2.Fundamental of Applied Statistics - S.C. Gupta & V.K. Kapoor – Sultan Chand

3. Statistical Methods - Snedecor G.W. & Cochran W.G. oxford & +DII

4. Elements of Statistics - Mode . E.B. – Prentice Hall

Outcome Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**
CO1	**2**	**3**	**3**	**3**	**2**
CO2	**1**	**3**	**2**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**2**	**2**
CO5	**1**	**3**	**3**	**3**	**3**

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER :II PART: III	DEPARTMENT ELECTIVE -II : PAPER-2 23URMTE25-2 RESOURCE MANAGEMENT TECHNIQUES	CREDIT : 3 HOURS : 4

COURSE OUTCOME:

1: use knowledge of operational research in LPP.
2: understand analogies between transportation problem, phenomena in operational Research.
3: formulate physical problems as operational research using assignment models
4: classify operational research, game theory, interpret the solutions.
5: interpret solutions in network analysis.

UNIT–I LINEAR PROGRAMMING **Hours: 12**

Definitions of OR - formulations of Linear programming problem - Graphical methods of solution - The simplex method - Artificial variables techniques - The Big-M method.

UNIT-II: **TRANSPORTATION MODELS** **Hours: 12**

Central difference Operators – Central differences formulae: Gauss Forward and Backward formulae – Sterling's formula – Bessel's formula (No derivations of formulae, simple problems only).

UNIT –III: **ASSIGNMENT MODELS** **Hours: 12**

Definition of Assignment models - Mathematical representation of assignment model- Solution of the assignment model - The Hungarian methods for solution of the assignment models – unbalanced assignment problem

SEQUENCING PROBLEM

Sequencing problems – Johnson's Algorithm- processing 'n' jobs through two machines - processing 'n' jobs through three machines - processing two jobs through 'm' machines .

UNIT –IV: GAME THEORY **Hours: 12**

Definitions - Rules for game theory - Rule 1 look for a pure strategy - Rule 2 reduce game by dominance - Rule 3 Solve for mixed strategy - Mixed strategies (2x2 games) - Mixed strategies (2xn games & mx2 games) - mixed strategies (3x3 or higher games).

UNIT –V: **NETWORK ANALYSIS** **Hours: 12**

Basic tools and techniques of project managements - Network logic - Numbering the events - Activity on node diagram - Critical path method - Program evaluation andreview technique [PERT].

TEXT BOOK:

1. Prem Kumar Gupta, D.S. Hira [2008], "Operation Research", S. Chand & Company Ltd, Re Print 2010, New Delhi.

Unit-I: Chapters: 1&2 –1: 1.2,2: 2.2, 2.3, 2.10, 2.11: 2.11.1, 2.11.2
(Pg: 4 to 5, 37 to 97,141 to 165)
Unit-II: Chapter 3: 3.1 to 3.4 (Pg: 212 to 248)
Unit-III: Chapters 4 &5: 4: 4.1-4.6, 5: 5.1, 5.4-5.7
(Pg: 306 to 334 , 381 to 382 & 387 to 408)
Unit-IV: Chapter 8: 8.4: 8.4.2 – 8.4.8(Pg: 692 to 724)
Unit-V: Chapter 14: 14.1 to 14.9(Pg: 1001 to 1050)

SUPPLEMENTARY READINGS:

1. Operation Research", Dr.S.J.Venkatesan, [2012], Sri Krishna Publications, Chennai.
2. Taha H. A.[2003], "Operations Research" , Macmillan Publishing Company, New York
3. J. K. Sharma, [2001], "Operations Research Theory and Applications", Macmillan, Delhi
4. P.R. Vittal [2003], "Operations Research" , Margham Publications, Chennai.

Outcome Mapping

	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	2	2
CO2	1	2	2	3	1
CO3	3	3	3	2	2
CO4	1	2	3	2	2
CO5	1	3	3	3	1

1 – Low, 2 – Moderate, 3 – High (Preferably use 2 or 3 levels)

SEMESTER:II	SKILL ENHANCEMENT COURSE-II(NME)	CREDIT:2
PART: IV	23UBCAS26 : MULTIMEDIA SYSTEMS	HOURS:2

COURSE OBJECTIVES

1. Understand the definition of Multimedia
2. To study about the Image File Formats, Sounds Audio File Formats
3. Understand the concepts of Animation and Digital Video Containers
4. To study about the Stage of Multimedia Project
5. Understand the concept of Ownership of Content Created for Proje Acquiring Talent

UNIT I : Multimedia Definition **Hours:6**

Use Of Multimedia - Delivering Multimedia - Text:About Fonts and Faces - Using Text in Multimedia - Computers and Text Font Editing and DesignTools - HypermediaandHypertext.

UNIT II:Images **Hours:6**

Plan Approach - Organize Tools - Configure Computer Workspace - Making Still Images - Color - Image File Formats. Sound: The Power of Sound - Digital Audio - Midi Audio - Midi vs. Digital Audio - Multimedia System Sounds Audio File Formats - Vaughan's Law of Multimedia Minimums - Adding Sound to Multimedia Project.

UNIT III:Animation **Hours:6**

The Power of Motion-Principles of Animation-Animation by Computer - Making Animations that Work. Video: Using Video - Working with Video and Displays - Digital Video Containers - Obtaining Video Clips - Shooting and Editing Video.

UNIT IV:Making Multimedia **Hours:6**

The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs-MultimediaProductionTeam.

UNIT V:PlanningandCosting **Hours:6**

The Process of Making Multimedia - Scheduling - Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: AcquiringContent-Ownership of Content Created for Project - Acquiring Talent

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1.understand the concepts, importance, application and the process of developing multimedia.

2.to have basic knowledge and understanding about image related processing.

3.To understand the framework of frames and bit images to animations.

4.Speaks about the multimedia projects and stages of requirement in phases of project.

5.Understanding the concept of cost involved in multimedia planning, designing, and producing

Text Books (In API Style)

1.TayVaughan,"Multimedia:MakingItWork",8thEdition,Osborne/McGraw-Hill,2001. “

Supplementary Readings

1.RalfSteinmetz&KlaraNahrstedt"MultimediaComputing,Communication&Applications",PearsonEducation,2012

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	**3**	**2**	**3**	**3**	**2**	**1**
CO 2	**3**	**2**	**3**	**3**	**2**	**1**
CO 3	**3**	**2**	**3**	**3**	**2**	**1**
CO 4	**3**	**2**	**3**	**3**	**1**	**1**
CO 5	**3**	**3**	**3**	**3**	**1**	**1**
Weightage of course contributed to each PSO	15	11	15	15	8	5

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:III PART: III	Core – V 23UBCAC33 : DATA STRUCTURES AND ALGORITHMS	CREDIT:5 HOURS:5

COURSE OBJECTIVES

1. To understand the concepts of ADTs
2. To learn linear data structures-lists, stacks, queues
3. To learn Tree structures and application of trees
4. To learn graph structures and application of graphs
5. To understand various sorting and searching

UNIT I : **Basics of ADT** **Hours:15**

Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists- doubly linkedlists-applications of lists-Polynomial Manipulation-All operations - Insertion - Deletion-Merge- Traversal

UNIT II:Stack & Queue Operations **Hours:15**

Stack ADT- Operations- Applications- Evaluating arithmetic expressions–Conversion of infix to postfix expression- QueueADT- Operations- CircularQueue-Priority Queue- deQueue applications of queues.

UNIT III:Trees **Hours:15**

TreeADT-treetraversals-Binary Tree ADT- expression trees- applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees-B-Tree-B+Tree –Heap-Applications of heap

UNIT IV:Graphs **Hours:15**

Definition- Representation of Graph-Types of graph- Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cutvertex- Euler circuits-Applications of graphs

UNIT V:Searching and Sorting **Hours:15**

Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertions Sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Understand the concept of Dynamic memory management, data types, algorithms.
2. Understand basic data structures such as arrays, linked lists, stacks and queues
3. Describe the hash function and concepts of collision and its resolution methods.
4. Solve problem involving graphs, trees and heaps.
5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

.

Text Books (In API Style)

1. Mark Allen Weiss –Data Structures and Algorithm Analysis in C++‖,Pearson Education2014,4thEdition.

2. ReemaThareja,–DataStructuresUsingC‖,OxfordUniversitiesPress2014,2nd Edition

Supplementary Readings

1.ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,–Introduction to Algorithms‖,McGrawHill2009,3rdEdition..

2.Aho,Hopcroft and Ullman ,–Data Structures andalgorithms‖,PearsonEducation2003

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**3**	**-**	**1**	**-**
CO2	**1**	**2**	**1**	**-**	**-**	**-**
CO3	**3**	**1**	**2**	**1**	**-**	**-**
CO4	**2**	**2**	**1**	**-**	**-**	**1**
CO5	**3**	**1**	**1**	**-**	**-**	**-**
Weightage of course contributed to each PSO	12	9	8	1	1	1

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:III PART: III	Core – VI Practical 23UBCAP34 : DATA STRUCTURES AND ALGORITHMS LAB	CREDIT: 5 HOURS: 4

COURSE OBJECTIVES

1. To understand the concepts of ADTs
2. To learn linear data structures- lists, stacks, queues
3. To learn Tree structures and application of trees
4. To learn graph structures and application of graphs
5. To understand various sorting and searching

LIST OF EXPERIMENTS

1. Write a program to implement the List ADT using arrays and linked lists.
2. Write a programs to implement the following using a singly linked list.
   Stack ADT, Queue ADT
3. Write a program that reads an infix expression, converts the expression
   To postfix form and then evaluates the postfix expression (use stack ADT).
4. Write a program to implement priority queue ADT.
5. Write a program to perform the following operations:
   Insert an element into a binary search tree.
   Delete an element from a binary search tree.
   Search for a key element in a binary search tree.
6. Write a program to perform the following operations
   Insertion into an AVL-tree
   Deletion from an AVL-tree
7. Write a programs for the implementation of BFS and DFS for a given graph.
8. Write a program for implementing the following searching methods:
   Linear search
   Binary search.
9. Write a program for implementing the following sorting methods:
   Bubble sort
   Selection sort
   Insertion sort
   Radix sort.

COURSE OUTCOMES

1. Understand the concept of Dynamic memory management, data types, algorithms
2. Understand basic data structures such as arrays, linked lists, stacks and queues.
3. Describe the hash function and concepts of collision and its resolution methods
4. Solve problem involving graphs, trees and heaps.
5. Apply Algorithm for solving problems like sorting, searching ,insertion and deletion of data

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	**2**	**2**	**2**	**2**	**3**	**2**
CO 2	**2**	**1**	**3**	**2**	**-**	**2**
CO 3	**3**	**3**	**1**	**1**	**1**	**2**
CO 4	**2**	**3**	**3**	**1**	**-**	**1**
CO 5	**3**	**2**	**3**	**1**	**1**	**-**
Weightage of course contributed to each PSO	12	11	12	7	5	7

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:III	ELECTIVE - PAPER-III	CREDIT:3
PART: III	23UBCAE35 - FINANCIAL ACCOUNTING	HOURS:4

(20% Theory and 80% Problem)

Course Objectives

1. To understand the basic accounting concepts and standards.
2. To know the basis for calculating business profits.
3. To familiarize with the accounting treatment of depreciation.
4. To learn the methods of calculating profit for single entry system
5. To gain knowledge on the accounting treatment of insurance claims.

Unit-I: **Fundamentals of Financial Accounting** **Hours=10**

Financial Accounting – Meaning, Definition, Objectives, Basic Accounting Concepts and Conventions - Journal, Ledger Accounts– Subsidiary Books — Trial Balance - Classification of Errors – Rectification of Errors – Preparation of Suspense Account – Bank Reconciliation Statement - Need and Preparation

Unit-II: **Final Accounts** **Hours=10**

Final Accounts of Sole Trading Concern- Capital and Revenue Expenditure and Receipts – Preparation of Trading, Profit and Loss Account and Balance Sheet with Adjustments

Unit-III: **Depreciation and Bills of Exchange** **Hours=10**

Depreciation - Meaning – Objectives – Accounting Treatments - Types - Straight Line Method – Diminishing Balance method – Conversion method. Units of Production Method – Cost Model vs Revaluation

Unit-IV: **Accounting from Incomplete Records** **Hours=10**

Incomplete Records -Meaning and Features - Limitations - Difference between Incomplete Records and Double Entry System - Methods of Calculation of Profit - Statement of Affairs Method – Preparation of final statements by Conversion method.

UnitV:**Royalty and Insurance Claims** **Hours=10**

Meaning – Minimum Rent – Short Working – Recoupment of Short Working – Lessor and Lessee – Sublease – Accounting Treatment.

Course Outcomes

1. Remember the concept of rectification of errors and Bank reconciliation statements
2. Apply the knowledge in preparing detailed accounts of sole trading concerns
3. Analyse the various methods of providing depreciation
4. Evaluate the methods of calculation of profit
5. Determine the royalty accounting treatment and claims from insurance companies in case of loss of stock.

Text Book:

1. S. P. Jain and K. L. Narang Financial Accounting- I, Kalyani Publishers, New Delhi.
2. S.N. Maheshwari, Financial Accounting, Vikas Publications, Noida.
3. R.L. Gupta and V.K. Gupta, "Financial Accounting", Sultan Chand, New Delhi

Supplementary reading:

1. Dr. Arulanandan and Raman: Advanced Accountancy, Himalaya Publications, Mumbai.
2. Charumathi and Vinayagam, Financial Accounting, S.Chand and Sons, New Delhi
3. Goyal and Tiwari, Financial Accounting, Taxmann Publications, New Delhi.

MAPPING WITH PROGRAMME OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	3	3	2	3	2	2	3	2	2
CO2	3	2	3	3	3	2	2	2	3	2	2
CO3	3	2	3	3	3	2	2	2	3	2	2
CO4	3	2	3	3	2	2	2	2	3	2	2
CO5	3	2	3	3	3	2	2	2	3	2	2
TOTAL	15	10	15	15	13	11	10	10	15	10	10
AVERAGE	3	2	3	3	2.6	2.2	2	2	3	2	2

3 – Strong, 2- Medium, 1- Low

SEMESTER:III PART: IV	SKILL ENHANCEMENT COURSE-4 23UBCAS36-ENTERPRISE RESOURCE PLANNING	CREDIT:1 HOURS:2

COURSE OBJECTIVES

1. To understand the basic concepts, Evolution and Benefits of ERP.
2. To know the need and Role of ERP in logical and Physical Integration
3. Identify the important business functions provided by typical business software .
4. To train the students to develop the basic understanding of how ERP enriches the Business organizations in achieving a multidimensional growth.
5. To aim at preparing the students technological competitive and make them ready t self-upgrade with the higher technical skills

UNIT I : **ERP Introduction** **Hours:6**

Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP, Components and needs of ERP,ERP Vendors; Benefits & Limitations of ERP Packages.

UNIT II: BPR and OLAP **Hours:6**

Business Process Reengineering, Data warehousing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management(PLM), LAP, Supply chain Management.

UNIT III:ERP Marketplace **Hours:6**

ERP Market place and Market place Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications..

UNIT IV: ERP Implementation Basics **Hours:6**

ERP implementation Strategy, ERP Implementation Life Cycle, Pre-Implementation task, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.

UNIT V:ERP & E-Commerce **Hours:6**

Future Directives-in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP in to or-generational culture. Using ERP tool : either SAP or ORACLE format to case study.

COURSE OUTCOMES

After completing the Course successfully, the student will be able to

1. Understand the basic concepts of ERP.
2. Identify different technologies used in ERP
3. Understand the concepts of ERP Manufacturing Perspective and ERP Modules
4. Discuss the benefits of ERP
5. Apply different tools used in ERP

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Text Books (In API Style)

1. Enterprise Resource Planning–Alexis Leon, Tata McGraw Hill

Supplementary Readings

1. Enterprise Resource Planning–Diversified by Alexis Leon, TMH
2. Enterprise Resource Planning–Ravi Shankar & S.Jaiswal, Galgotia

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**1**	**3**	**2**	**1**	**3**	**2**
CO2	**3**	**2**	**-**	**1**	**2**	**-**
CO3	**2**	**3**	**2**	**2**	**3**	**2**
CO4	**1**	**-**	**2**	**1**	**-**	**2**
CO5	**3**	**3**	**-**	**1**	**3**	**-**
Weight age of course contributed to each PSO	10	11	6	7	11	6

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:III PART: IV	SKILL ENHANCEMENT COURSE-5 23UBCAS37- ADVANCED EXCEL	CREDIT:2 HOURS:2

COURSE OBJECTIVES

1. Handle large amounts of data .
2. Aggregate numeric data and summarize into categories and subcategories
3. Filtering, sorting, and grouping data or subsets of data
4. Create pivot tables to consolidate data from multiple files
5. Presenting data in the form of charts and graphs

UNIT I : **Basics of Excel** **Hours:6**

Customizing common options-Absolute and relative cells-Protecting and un-protecting worksheets and cells-Working with Functions-Writing conditional expressions-logical functions-lookup and reference functions-V look UP with Exact Match, Approximate Match-Nested V look UP with Exact Match-V look UP with Tables, Dynamic Ranges-Nested V look UP with Exact Match-Using V Look UP to consolidate Data from Multiple Sheets

UNIT II: Data Validations **Hours:6**

Specifying a valid range of values-Specifying a list of valid values-Specifying custom validations based on formula-Working with Templates Designing the structure of a template-templates for standardization of worksheets - Sorting and Filtering Data – Sorting tables-multiple-level sorting-custom sorting-Filtering data for selected view - advanced filter options-Working with Reports Creating subtotals-Multiple-level subtotal.

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UNIT III:PivotTabes **Hours:6**

Creating Pivot tables Formatting and customizing Pivot tables- advanced options of Pivot tables-Pivot charts- Consolidating data from multiple sheets and files using Pivot tables-external data sources-data consolidation feature to consolidate data-Show Value As % of Row, %of Column, Running Total, Compare with Specific Field-Viewing Subtotal under Pivot-Creating Slicers

UNIT IV: Functions **Hours:6**

More Functions Date and time functions-Text functions-Database functions-Power Functions - FormattingUsingauto formatting option for worksheets-Using conditional formatting option for rows,columns andcells-WhatIfAnalysis- GoalSeek-DataTables-Scenario Manager.

UNIT V:Charts **Hours:6**

Charts -Formatting Charts-3D Graphs-Bar and Line Chart together-Secondary Axis in Graphs-Sharing Charts with PowerPoint/ MS Word, Dynamically- New Features Of Excel Spark lines , Inline Charts, data Charts-Overview of all the new features.

COURSE OUTCOMES

1. Work with bigdata tools and its analysis techniques.
2. Analyzed at a by utilizing clustering and classification algorithms.
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data.
4. Perform analytics on data streams.
5. LearnNo-SQL databases and management

Text Books (In API Style)

1. Excel2019All
2. MicrosoftExcel2019PivotTable Data Crunching

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**2**	**2**	**2**	**1**	**3**	**-**
CO2	**3**	**2**	**2**	**1**	**1**	**3**
CO3	**3**	**2**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**2**	**2**	**2**	**1**
CO5	**3**	**2**	**1**	**3**	**1**	**3**
Weightage of course Contributed to each PSO	14	11	8	9	8	10

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:IV	Core -VII	CREDIT:5
PART: III	23UBCAC43 - PROGRAMMING IN JAVA	HOURS:5

COURSE OBJECTIVES

1. To provide fundamental knowledge of object-oriented programming
2. To equip the student with programming knowledge in Core Java from th basics up
3. To enable the students to use AWT controls, Event Handling and Swing fo GUI.
4. To provide fundamental knowledge of object-oriented programming
5. To provide the knowledge of Swing in Java

UNIT I : **Introduction** **Hours:15**

Object Oriented concepts-History of Java-Java buzzwords-JVM architecture-Data types-Variables-Scope and lifetime of variables arrays-operators-control statements-type conversion and casting-simple java program-constructors-methods-Static block-Static Data-Static Method String and String Buffer Classes.

UNIT II: Inheritance **Hours:15**

Basic concepts - Types of inheritance -Member access rules- Usage of this and Super keyword-Method Overloading-Method overriding-Abstract classes - Dynamic method dispatch - Usage off in al keyword. Packages: Definition-Access Protection-Importing Packages. Interfaces: Definition–Implementation–Extending Interfaces**.** Exception Handling: try–catch- throw - throws–finally–Built-in exceptions- Creating own Exception classes

UNIT III: MultithreadedProgramming **Hours:15**

Thread Class-Runnable interface–Synchronization–Using synchronized methods–Using synchronized statement-Inter thread Communication–Deadlock. I/O Streams: Concepts of streams-Stream classes-Byte and Character stream-Reading console Input and Writing Console output-File Handling.

UNIT IV: AWTControls **Hours:15**

The AWT class hierarchy-user interface components-Labels-Button-Text Components - Check Box - Check Box Group - Choice -List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. Event Handling: Events-Event sources-Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.

UNIT V: Swing **Hours:15**

Introduction to Swing-Hierarchy of swing components. Containers-Top level containers-JFrame-JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox-JRadioButton-JLabel,JTextField-JTextArea-JList-JComboBox-JScrollPane

COURSE OUTCOMES

1.Understand the basic Object-oriented concepts. Implement the basic constructs of CoreJ ava

2.Implement inheritance, packages, interfaces and Exception handling of Core Java.

3. Implement multi-threading and I/O Streams of Core Java

4. Implement AWT and Event handling.

5. Use Swing to create GUI.

Text Books (In API Style)

1.Herbert Schildt,The Complete Reference,TataMcGraw Hill,New Delhi,7th Edition,2010.

2. GaryCornell,*CoreJava2VolumeI–Fundamentals,*AddisonWesley,1999

Supplementary Readings

1.Head First Java, O'Rielly Publications,.

2.Y.Daniel Liang, *Introduction to Java Programming*, 7th Edition,Pearson Education India,2010

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**-**	**2**	**2**	**2**
CO2	**3**	**1**	**2**	**1**	**2**	**2**
CO3	**1**	**-**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**1**	**2**	**-**	**2**	**2**	**2**
Weightage of course contributed to each PSO	10	7	6	9	10	10

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:IV PART: III	Core – VIII- Practical 23UBCAP44: PROGRAMMING IN JAVA LAB (PRACTICAL)	CREDIT:5 HOURS:4

Course Objective

1.To provide fundamental knowledge of object-oriented programming

2.To equip the student with programming knowledge in Core Java from the basics up.

3.To enable the students to know about Event Handling.

4.To enable the students to use String Concepts

5.To equip the student with programming knowledge into create GUI using AWT controls.

List of Programs:

1Writea Java program that prompts the user for an integer and then prints Out all the prime numbers up to that Integer.

2.Write a Java program to multiply two given matrices

3. Write a Java program that displays the number of characters, lines and words in a text.

4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.

5. Write a program to do String Manipulation using Character Array and perform the following string operations:

- String length
- Finding a character at a particular position
- Concatenating two strings

6.Write a program to perform the following string operations using String class:

- String Concatenation
- Search a substring
- To extract substring from given string

7. Write a program to perform string operations using String Buffer class:

- Length of a string
- Reverse a string
- Delete a substring from the given string.

8. Write a java program that implements a multi-thread application.

9. Write a program to demonstrate the use of following exceptions.

- Arithmetic Exception
- Number Format Exception
- Array Index Out of Bound Exception
- Negative Array Size Exception

10. Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes

11. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.

12. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired.(Use adapter classes).

13. Write a Java program that works as a simple calculator.

14. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with‖stop‖or‖ready‖or‖go‖ should appear above the buttons in a selected color. Initially there is no message shown

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**1**	**3**	**2**	**3**
CO2	**3**	**2**	**1**	**3**	**1**	**3**
CO3	**3**	**2**	**1**	**3**	**2**	**3**
CO4	**3**	**2**	**1**	**3**	**2**	**3**
CO5	**3**	**2**	**1**	**3**	**2**	**3**
Weight age of course contributed To each PSO	15	10	5	15	9	15

S-Strong-3M-Medium-2L-Low-1

SEMESTER:IV PART: III	ELECTIVE- PAPER-IV 23UBCAE45 - COST AND MANAGEMENT ACCOUNTING	CREDIT:3 HOURS:4

Course Objective

1. To understand the various concepts of cost accounting
2. To prepare and reconcile Cost accounts
3. To gain knowledge regarding valuation methods of material
4. To learn about budgetary control
5. To gain insights into marginal costing.

Unit-I: Introduction of Cost Accounting **Hours=10**

Definition-Nature and Scope – Principles of Cost Accounting – Cost Accounting and Financial Accounting - Cost Accounting Vs Management Accounting –Installation of Costing System –Classification of Costs– Cost Centre– Profit Centre

Unit-II: Cost Sheet and Methods of Costing **Hours=10**

Preparation of Cost Sheet - Tenders & Quotations - Reconciliation of Cost and Financial Accounts –Unit Costing-Job Costing.

Unit-III: Material Costing **Hours=10**

Material Control – Meaning and Objectives – Purchase of Materials – EOQ –Stores Records – Reorder Levels – ABC Analysis - Issue of Materials –Methods of Issue – FIFO – LIFO – Base Stock Method – Specific Price Method – Simple and Weighted Average Method.

Unit-IV: **Budget and Budgetary Control** **Hours=10**

Meaning – Preparation of Various Budgets – Cash Budget - Flexible Budget– Production Budget – Sales Budget – Master Budget – Budgetary Control – Benefits

Unit-V: Marginal Costing **Hours=10**

Meaning - Features – Marginal Costing vs Absorption Costing - Fixed Cost, Variable Cost and Semi Variable Cost- Contribution- Marginal Cost Equation- P/V Ratio - Break Even Point - Margin of Safety – Cost- Volume Profits Analysis.

Course Outcome:

1.Remember and recall the various concepts of cost accounting

2. Demonstrate the preparation and reconciliation of cost sheet.

3. Analyse the various valuation methods of issue of materials.

4. Evaluate techniques of budgetary control

5. Formulate criteria for decision making using principles of marginal costing.

Textbooks

1. Jain S.P. and Narang K.L, Cost Accounting. Kalyani Publishers, New Delhi
2. Dr.S.N. Maheswari, Principles of Cost Accounting, Sultan Chand Publications, New Delhi.
3. Jain S.P. & Narang K.L. (2018) Cost and Management Accounting, Kalyani Publications,

Reference Books

1.Polimeni, Cost Accounting: Concepts and Applications for Managerial Decision Making, 1991, McGraw–Hill, New York.

2. Chadwick – The Essence of Management Accounting, Financial Times Publications, England.

MAPPING WITH PROGRAMME OUTCOMES

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	2	2	2	3	2	2
CO2	3	2	2	2	2	2	2	2	3	2	2
CO3	3	2	3	2	2	2	2	2	3	2	2
CO4	3	2	2	2	2	2	2	2	3	2	2
CO5	3	2	3	2	2	2	2	2	3	2	2
TOTAL	15	10	13	10	10	10	10	10	15	10	10
AVERAGE	3	2	2.6	2	2	2	2	2	3	2	2

3 – Strong, 2- Medium, 1- Low

SEMESTER:IV PART: IV	SKILL ENHANCEMENT COURSE-6 23UBCAS46-WEB DESIGNING	CREDIT:2 HOURS:2

COURSE OBJECTIVES

1. Understand the basics of HTML and its components
2. To study about the Graphics in HTML
3. Understand and apply the concepts of XML and DHTML
4. Understand the concept of JavaScript
5. To identify and understand the goals and objectives of the Ajax

UNIT I : **HTML** **Hours:6**

Introduction-tag basics-page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color- alignment links-tables-frames.

UNIT II: Forms&ImagesUsingHtml **Hours:6**

Graphics: Introduction-How to work efficiently with images in web pages ,image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for Building web page front page.

UNIT III: XML & DHTML **Hours:6**

Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language(XML).

UNIT IV: Dynamic HTML **Hours:6**

Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition.

UNIT V: Advancescript **Hours:6**

JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.

COURSE OUTCOMES

1. Developworking knowledge of HTML
2. AbilitytoDevelopandpublishWebpagesusingHypertextMarkupLanguage(HTML).
3. Abilitytooptimizepagestylesandlayoutwith CascadingStyleSheets(CSS).
4. Abilitytodevelopajavascript
5. AnabilitytodevelopwebapplicationusingAjax.

Text Books (In API Style)

1. PankajSharma,–WebTechnology‖,SkKataria&SonsBangalore2011.
2. MikeMcgrath,–JavaScript‖,DreamTechPress2006,1stEdition.
3. AchyutSGodbole&AtulKahate,–WebTechnologies‖,2002,2ndEdition

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**-**	**2**	**1**	**1**
CO2	**3**	**3**	**-**	**2**	**-**	**1**
CO3	**3**	**3**	**-**	**2**	**2**	**1**
CO4	**3**	**3**	**-**	**2**	**-**	**1**
CO5	**3**	**3**	**3**	**2**	**-**	**1**
Weight age of course contributed to each PSO	15	15	3	10	3	4

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:IV PART: IV	SKILL ENHANCEMENT COURSE-7 23UBCAS47-PHP PROGRAMMING	CREDIT:2 HOURS:2

COURSE OBJECTIVES

1. To provide the necessary knowledge on basics of PHP.
2. To design and develop dynamic, database-driven web applications using PHP version
3. To get an experience on various web application development techniques
4. To learn the necessary concepts for working with the files using PHP.
5. To get a knowledge on OOPS with PHP.

UNIT I : **Introduction to PHP** **Hours:6**

Basic Knowledge of websites-Introduction of Dynamic Website-Introduction to PHP-Scope of PHP-XAMPP **and** WAMP Installation

UNIT II: PHP Programming Basics **Hours:6**

Syntax of PHP-Embedding PHP in HTML-Embedding HTML in PHP. Introduction to PHP Variable -Understanding Data Types –Using Operators -Using Conditional Statements -If(), else if() and else if condition Statement.

UNIT III: Function & Arrays **Hours:6**

Switch() Statements-Using the while() Loop-Using the for() Loop PHP Functions. PHP Functions-Creating an Array-Modifying Array Elements-Processing Arrays with Loops-Grouping Form Selections with Arrays-Using Array Functions.

UNIT IV: PHP Advanced Concepts **Hours:6**

Reading and Writing Files -Reading Data from a File.

UNIT V: Cookies **Hours:6**

Managing Sessions and Using Session Variables-Destroying a Session-Storing Data in Cookies-Setting Cookies.

COURSE OUTCOMES

1. Write PHPscripts to handle HTMLforms
2. Write regular expressions including modifiers,operators,and meta characters
3. Create PHP Program using the concept of array
4. Create PHP programs that use various PHP library functions
5. Manipulate files and directories

Text Books (In API Style)

1. Head First PHP & MySQL: A Brain-Friendly Guide-2009-Lynnmighley and Michael Morrison.

2.The Joy ofPHP:A Beginner's Guideto Programming Interactive Web Applications with PHP and MySQL- Alan Forbes

Supplementary Reading:

1. PHP:The Complete Reference-Steven Holzner.

2. DT Editorial Services(Author),–HTML5 BlackBook(CoversCSS3,JavaScript,XML, XHTML,AJAX,PHP,jQuery)‖,Paper back 2016,2nd Edition.

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**3**	**1**	**1**	**-**	**1**
CO2	**2**	**-**	**1**	**1**	**2**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**1**
CO4	**1**	**3**	**2**	**1**	**-**	**1**
CO5	**3**	**2**	**1**	**1**	**-**	**1**
Weight age of course contributed to each PSO	12	11	6	5	2	5

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:V	Core – IX	CREDIT:4
PART: III	23UBCAC51:OPERATING SYSTEM	HOURS:5

COURSE OBJECTIVES

1. Understanding the design of the Operating System
2. Imparting knowledge on CPU scheduling, Process and Memory Management
3. To code specialized programs for managing overall resources and operations of the computer.
4. To study about the concept of Job and processor scheduling
5. To learn about the concept of memory organization and multiprogramming

UNIT I : **Introduction** **Hours:15**

Operating system,history (1990sto2000andbeyond),distributed computing,parallel computation.Process concepts:definition of process,process states-Life cycle of a process,process management-process statetransitions,process control block(PCB), process operations , suspend andresume,contextswitching,Interrupts-Interrupt processing,interrupt classes,Interprocess communication-signals,message passing

UNIT II Asynchronous concurrent processes **Hours:15**

Mutual exclusion- critical section, mutual exclusion primitives, implementing mutual exclusion primitives, Peterson‘s algorithm, software solutions to the mutual Exclusion Problem-,n-thread mutual exclusion- Lamports Bakery
Algorithm. Semaphores–Mutual exclusion with Semaphores, thread synchronization with semaphores counting semaphores, implementing semaphores.

UNIT III: Deadlockandindefinitepostponement **Hours:15**

Resource concepts,four necessary conditions for deadlock,deadlock prevention, deadlock avoidance and Dijkstra‘s Banker‘s algorithm,deadlock detection,deadlock recovery.

UNIT IV: Job and processor scheduling **Hours:15**

Scheduling levels,scheduling objectives, scheduling criteria, preemptive vs non-preemptive scheduling,interval timer or interruptingclock,priorities,scheduling algorithms-FIFO scheduling, RR scheduling, quantum size, SJF scheduling,SRT scheduling,HRNscheduling,multilevel feedback queues,Fair share scheduling.

UNIT V: Real Memory organization and Management **Hours:15**

Memory organization, Memory management, Memory hierarchy, Memory management strategies, contiguous svsnon-contiguous memory allocation, single user contiguous memory allocation, fixed partition multiprogramming, variable partition multiprogramming, Memory swapping Virtual Memory organization: virtual memory basic concepts, multilevel storage organization, block mapping, paging basic concepts, segmentation, paging/segmentation systems. Virtual Memory Management: Demand Paging, Page replacement strategies

COURSE OUTCOMES

1. Define the fundamentals of OS and identify the concepts relevant to process,process life cycle
2. Knowthe critical analysis of process involving various algorithms, an exposure to threads and semaphores
3. Have a complete study about Deadlock and itsimpact over OS
4. Have complete knowledge of Scheduling Algorithms and its types
5. Understand memory organization and management

Text Books (In API Style)

1. H.M.Deitel,OperatingSystems,Third Edition,Pearson Education Asia,2011

Supplementary Readings

1. William Stallings, Operating System: Internals and Design Principles ,Seventh Edition, Prentice-Hall of India,2012.
2. A.Silberschatz, and P.B. Galvin.,Operating Systems Concepts, Nineth Edition, JohnWiley&Sons(ASIA)PteLtd.,2012

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**-**	**1**	**2**	**-**	**1**
CO2	**2**	**3**	**1**	**2**	**-**	**1**
CO3	**3**	**2**	**-**	**3**	**-**	**1**
CO4	**1**	**3**	**1**	**1**	**3**	**2**
CO5	**3**	**-**	**1**	**3**	**2**	**1**
Weightage of course contributed to each PSO	12	8	4	11	5	6

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:V PART: III	Core – X 23UBCAC52: ASP.NET PROGRAMMING	CREDIT:4 HOURS:5

COURSE OBJECTIVES

1. To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language
2. To develop ASP.NET Webapplication using standard controls
3. To implement file handling operations.
4. To handles SQL Server Database using ADO.NET.
5. Understand the Gridview control and XMLclasses

UNIT I : **Overviewof.NETframework** **Hours:15**

Common Language Runtime(CLR),Framework Class Library-C# Fundamentals: Primitive types and Variables – Operators –Conditional statements-Looping statements –Creating and using Objects–Arrays–String operations

UNIT II :IntroductiontoASP.NET **Hours:15**

IDE-Languages supported Components-Working with Web Forms–Web form standard controls: Properties and its events–HTML controls-List Controls: Properties and its events.

UNIT III: RichControls **Hours:15**

Properties and its events–validation controls: Properties and its events– File Stream classes -File Modes – File Share – Reading and Writing to files –Creating, Moving, Copying and Deleting files –File uploading.

UNIT IV: ADO.NETOverview **Hours:15**

Database Connections–Commands–Data Reader-Data Adapter-Data Sets-Data Controls and its Properties–Data Binding

UNIT V: **Hours:15**

Grid View control: Deleting, editing, Sorting and Paging. XML classes–Web form to manipulate XML files-Website Security-Authentication-Authorization–Creating a Web application.

COURSE OUTCOMES

1.Develop working knowledge of C# programming constructs and the .NET Framework.

2. To develop a software to solve real-world problems using ASP.NET

3. To Work On Various Controls Files

4. To create a web application using Microsoft ADO.NET

5. To develop web applications using XML

Text Books (In API Style)

1. Svetlin Nakov, VeselinKolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019
2. Mathew, MacDonald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015**.**

Supplementary Readings

1. HerbertSchildt,TheCompleteReferenceC#.NET,TataMcGraw-Hill,2017.
2. KogentLearningSolutions,C#2012ProgrammingCovers .NET4.5BlackBook,Dreamtechpres,2013.
3. AnneBoehm,JoelMurach,Murach'sC#2015,MikeMurach&AssociatesInc.2016.

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**1**	**2**	**2**	**1**	3
CO2	**3**	**2**	**2**	**2**	**2**	3
CO3	**3**	**3**	**2**	**2**	**3**	3
CO4	**3**	**1**	**2**	**2**	**1**	3
CO5	**3**	**1**	**2**	**2**	**1**	2
Weightage of course contributed to each PSO	15	8	10	10	8	14

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:V PART: III	Core - XI 23UBCAP53: ASP .NET PROGRAMMING LAB (PRACTICAL)	CREDIT:4 HOURS:5

Course Objectives

1. To develop ASP.NET Web application using standard controls
2. To create rich database applications using ADO.NET.
3. To implement file handling operations.
4. To implement XML classes.
5. To utilize ASP.NET security features for authenticating the website

List of programs

1. Create an exposure of Web applications and tools.
2. Implement the Html Controls.
3. Implement the Server Controls
4. Web application using Web controls.
5. Web application using List controls.
6. Web Page design using Rich control. Validate user input using Validation controls. Working with File concepts.
7. Web application using Data Controls.
8. Data binding with Web controls
9. Data binding with Data Controls.
10. Database application perform insert, update and delete operations.
11. Database application using Data Controls to Perform insert, delete, edit, paging and sorting operation.
12. Implement the Xml classes.
13. Implement Authentication–Authorization.
14. Ticket reservation using ASP.NET controls.
15. Online examination using ASP.NET controls

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**2**	**2**	**1**	1
CO2	**3**	**2**	**3**	**2**	**2**	2
CO3	**3**	**3**	**2**	**2**	**1**	1
CO4	**3**	**2**	**3**	**2**	**1**	1
CO5	**3**	**2**	**2**	**2**	**1**	2
Weightage of course contributed to each PSO	**15**	11	12	10	6	7

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:V CORE - XII PART: III	23UBCAD54: PROJECT WITH VIVA-VOCE	CREDIT:4 HOURS:5

Self-learning is enhanced
Application of the concept to real situation is conceived resulting in tangible outcome

(Refer to regulations for additional information)

SEMESTER:V PART: III	ELECTIVE V 23UBCAE55-1: DATABASE MANAGEMENT SYSTEM	CREDIT:3 HOURS:4

Course Objective

1. To enable the students to learn the designing of database systems, foundation on the Relational model of data and normal forms.
2. To understood the concepts of database management system, design simple Database Models.
3.To learn and understand to write queries using SQL,PL/SQL
4. To enable the students to learn the designing of database systems, foundation on the Relational model of data and normal forms.
5. To understood the concepts of database management system, design simple Database Models.

UNIT I : **Database Concepts** **Hours:10**

Database Systems-Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models-Importance-Basic Building Blocks-Business rules - Evolution of Data models - Degrees of Data Abstraction

UNIT II : Design Concepts **Hours:10**

Relational database model – logical view of data-keys-Integrity rules-relational set operators – data dictionary and the system catalog-relationships-data redundancy revisited-indexes-codd'srules.Entity relationship model-ER diagram.

UNIT III: Normalization of Database Tables **Hours:10**

Database tables and Normalization – The Need for Normalization –The Normalization Process–Higher level Normal Form. Introduction to SQL: Data Definition Commands–Data Manipulation Commands–SELECT Queries–Additional Data Definition Commands–Additional SELECT Query Keywords–Joining Database Tables.

UNIT IV: Advanced SQL **Hours:10**

Relational SET Operators: UNION –UNIONALL–INTERSECT-MINUS. SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join.Sub Queries and Correlated Queries: WHERE – IN – HAVING –ANY and ALL – FROM. SQL Functions: Date and Time Function–Numeric Function–String Function–Conversion Function

UNIT V: PL/SQL **Hours:10**

.A Programming Language: History–Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration –Assignment operation – Arithmetic operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks–SQL in PL/SQL–Data Manipulation– Transaction Control statements.PL/SQL Cursors and Exceptions: Cursors – Implicit Cursors, Explicit Cursors and Attributes–Cursor FOR loops–SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables –Exceptions– Types of Exceptions.

Course Outcome

1. Understand the various basic concepts of Data Base System. Difference between file system and DBMS
2. Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.
3. Design database schema considering normalization and relationships within database
4. Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.
5. Learn to design Database operations and implement using PL/SQL programs

Text Book:

1. Coronel, Morris,Rob, "Database Systems, Design, Implementation and Management", Ninth Edition Supplementary Reading.

2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan ,–Database System Concepts, McGraw Hill International Publication, VI Edition

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	3	3	2	3
CO3	3	3	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:V	ELECTIVE : V	CREDIT:3
PART: III	23UBCAE55-2: INTRODUCTION TO DATA SCIENCE	HOURS:4

Course Objective

1. To learn about basics of Data Science and Big data.
2. To learn about overview and building process of Data Science.
3. To learn about various Algorithms in Data Science.
4. To learn about Hadoop Framework
5. To learn about case study about Data Science

UNIT I : **Introduction** **Hours:10**

Benefits and uses–Facts of data–Data science process–Big data ecosystem and data science

UNIT II : TheDatascienceprocess **Hours:10**

Overview–research goals-retrieving data-transformation–Exploratory Data Analysis–Model building

UNIT III: Algorithms **Hours:10**

Machine learning algorithms–Modeling process–Types–Supervised– Unsupervised-Semi-supervised

UNIT IV: IntroductiontoHadoop **Hours:10**

Hadoop framework–Spark–replacing Map Reduce–No SQL–ACID–CAP–BASE–types

UNIT V: CaseStudy **Hours:10**

Prediction of Disease-Setting research goals-Data retrieval–preparation-exploration-Diseaseprofiling-presentationandautomation.

Course Outcome

1. Understand the basics in Data Science and Big data.
2. Understand overview and building processing Data Science
3. Understand various Algorithms in Data Science
4. Understand Hadoop Framework in Data Science.
5. Case study in Data Science

Text Book

1. DavyCielen, ArnoD.B. Meysman, MohamedAli,–Introducing Data Science‖, Manning publications2016

Supplementary Reading

1.RogerPeng,–TheArtofDataScience‖,lulu.com2016.

2. DavyCielen,ArnoD.B.Meysman,MohamedAli,–IntroducingDataScience:Big Data,MachineLearning,andMore,UsingPythonTools‖,DreamtechPress2016

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	`1	2	2	-
CO2	2	3	2	2	-	1
CO3	3	2	2	1	1	3
CO4	1	2	2	1	3	1
CO5	2	2	-	3	1	1
Weightage of course contributed to each PSO	11	11	7	9	7	6

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:V PART: III	ELECTIVE : VI 23UBCAE56-1: SOFTWARE ENGINEERING	CREDIT:3 HOURS:4

Course Objective

1. Gain basic knowledge of analysis and design of systems
2. Ability to apply software engineering principles and techniques
3. Model are liable and cost-effective software system
4. Ability to design an effective model of the system
5. Perform Testing at various levels and produce an efficient system

UNIT I : **Introduction** **Hours:15**

The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. Software LifeCycle Models: Why use a lifecycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different lifecycle models.

UNIT II : Requirements Analysis and Specification **Hours:15**

Requirements gathering and analysis, Software requirements specification (SRS) Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object-oriented vs function-oriented design

UNIT III: Function-Oriented Software Design **Hours:15**

Overview of SA/SD methodology, structured analysis, data flow diagrams(DFD‘s), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.

UNIT IV: Coding and Testing **Hours:15**

Coding; code review, testing, testing in the large vs testing in the small, unit testing, black- boxtesting, white-boxtesting, debugging, program analysis tools, integration testing, system testing, some general issues associated with testing.

UNIT V: Computer Aided Software Engineering **Hours:15**

CASE and its scope, CASE environment, CASE support in software life cycle, other characteristics of CASE tools, towards second generation CASE tool, architecture of a CASE environment. Software Maintenance**:** Characteristic of software maintenance, software reverse engineering, software maintenance process models, estimation of maintenance cost.

Course Outcome:

1.Gain basic knowledge of analysis and design of systems
2.Ability to apply software engineering principles and techniques
3. Model are liable and cost-effective software system
4. Ability to design an effective model of the system
5. Perform Testing at various levels and produce an efficient system.

Text Book:

1. RajibMall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India,2018

Supplementary Reading

1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill
Publishing company Ltd, Edition1997.
2. Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**2**	**3**	**2**	**1**	**-**
CO2	**3**	**-**	**1**	**-**	**-**	**2**
CO3	**1**	**2**	**3**	**2**	**2**	**1**
CO4	**3**	**-**	**2**	**2**	**-**	**1**
CO5	**1**	**2**	**3**	**3**	**1**	**1**
Weightage of course contributed to each PSO	11	6	12	9	4	5

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:V PART: III	ELECTIVE : VI 23UBCAE56-2: DATA MINING AND WAREHOUSING	CREDIT:3 HOURS:4

Course Objective:

1.To provide the knowledge on Data Mining and Ware housing concepts and techniques
2. To study the basic concepts of Data Mining, Architecture and Comparison
3. To study a set of Mining Association Rules, Data Warehouses.
4. To study about Classification and Prediction, Classifier Accuracy
5. To study the basic concepts of cluster analysis, Cluster Methods

Unit-I: Introduction: **Hours=10**

Data mining–Functionalities–Classification–Introduction to Data Warehousing–Data Preprocessing: Preprocessing the Data–Data cleaning Data Integration and Transformation–Data Reduction

Unit-II: Data Mining Primitives **Hours=10**

Languages and System Architecture: Data Mining–Primitives–Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison–Statistical Measures.

Unit-III: Mining Association Rules **Hours=10**

Basic Concepts–Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data warehouses.

Unit-IV: Classification and Prediction: **Hours=10**

Introduction– Issues–Decision Tree Induction– Bayesian Classification–Classification of Back Propagation. Classification based on ConceptsfromAssociationRuleMining–OtherMethods.Prediction–Introduction–ClassifierAccuracy

Unit-V: Cluster Analysis: **Hours=10**

Types of Data in Cluster Analysis, Petitioning Methods–Hierarchical Methods-Density Based Methods–GRID Based Method–Model based Clustering Method

Course outcome:

1. To understand the basic concepts and the functionality of The various data mining and data warehousing component
2. To know the concepts of Data mining system architectures
3. To analyze the principles of association rules
4. To get analytical idea on Classification and prediction methods
5. To Gain knowledge on Cluster analysis and its methods.

Text Books

1. HanandM.Kamber,–DataMiningConceptsandTechniques‖,2001,Harcourt India Pvt .Ltd, New Delhi.

Supplementary Reading:

1. K.P.Soman, Shyam Diwakar, V.Ajay–Insight into Data Mining Theory and Practice–,Prentice Hall of India Pvt. Ltd, New Delhi

2.ParteekBhatia,_Data Mining and Data Warehousing: Principles and Practical Techniques‘,Cambridge University Press,2019

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	2	2	-	3	-	3
CO4	3	3	2	3	1	1
CO5	1	3	3	3	3	2
Weightage of course Contributed to each PSO	12	14	10	15	9	11

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:V **PART: IV**	**23UBCAI58: SUMMER INTERNSHIP**	**CREDIT:2** **HOURS:-**

(Refer to the Regulations)

SEMESTER:VI PART: III	Core - XIII 23UBCAC61:COMPUTER NETWORKS	CREDIT:4 HOURS:6

COURSE OBJECTIVES

1. To understand the concept of Data communication and Computer network
2. To get a knowledge on routing algorithms.
3. To impart knowledge about networking and inter networking devices
4. To study about Network communication
5. To learn the concept of Transport layer

UNIT I : Introduction **Hours:15**

Network Hardware–Software–Reference Models–OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Communication - Guided Transmission Media

UNIT II WirelessTransmission **Hours:15**

Communication Satellites Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues–Error Detection and Correction

UNIT III: Elementary Data Link Protocols **Hours:15**

Sliding Window Protocols – DataLink Layer in the Internet - Medium Access Layer – Channel Allocation Problem–Multiple Access Protocols–Bluetooth

UNIT IV: NetworkLayer **Hours:15**

Design Issues-Routing Algorithms-Congestion Control Algorithms–IP Protocol–IP Addresses–Internet Control Protocols.

UNIT V: TransportLayer **Hours:15**

Services-Connection Management-Addressing, Establishing and Releasing a Connection–Simple Transport Protocol–Internet Transport Protocols (ITP) Network Security: Cryptography

COURSE OUTCOMES

1. To Understand the basics of Computer Network architecture, OSI and TCP/IP reference model.
2. To gain knowledge on Telephone systems using wireless network
3. To understand the concept of MAC
4. To analyze the characteristics of Routing and Congestion control algorithms
5. To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS.

Text Books (In API Style)

1. A.S.Tanenbaum,–ComputerNetworks ǁ,4thEdition, Prentice - HallofIndia,2008

Supplementary Readings

1. B.A. Forouzan,–Data Communications and Networkingǁ,TataMcGrawHill,4th Edition, 2017.
2. F. Halsall, –Data Communications, Computer Networks and Open Systemsǁ,PearsonEducation,2008

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**2**	**1**	**-**
CO2	**3**	**2**	**1**	**2**	**2**	**-**
CO3	**3**	**-**	**-**	**2**	**-**	**2**
CO4	**3**	**1**	**-**	**2**	**1**	**-**
CO5	**3**	**3**	**-**	**2**	**1**	**-**
Weight age of course Contributed to each PSO	15	8	1	10	5	2

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:VI PART: III	Core - XIV 23UBCAC62:DATA ANALYTICS USING R PROGRAMMING	CREDIT:4 HOURS:6

COURSE OBJECTIVES

1. To understand the problem solving approaches
2. To learn the basic programming constructs in R Programming
3. To learn the basic programming constructs in R Programming
4. To use R Programming data structures-lists, tuples, and dictionaries.
5. To do input/output with files in R Programming

UNIT I : **Introduction**

Hours:15

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating —The Promotion of the Value of Big Data — Big DataUse Cases- Characteristics of Big Data Applications —Perception and Quantification of Value –Understanding Big Data Storage —A General Overview of High-Performance Architecture—HDFS— Map Reduce and YARN— MapReduce Programming Model

UNIT II: CONTROL STRUCTURES AND VECTORS **Hours:15**

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

UNIT III: LISTS **Hours:15**

Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements,Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-LikeOperations

UNIT IV: FACTORSANDTABLES **Hours:15**

Factors and Levels, Common Functions Used with Factors, Working with Tables,Matrix/Array-Like Operations on Tables, Extracting a Sub table, Finding the Largest Cells in aTable,Math Functions,Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions R PROGRAMMING

UNIT V: OBJECT-ORIENTEDPROGRAMMINGSClasses Hours:15

S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

COURSE OUTCOMES

1. Work with big data tools and its analysis techniques
2. Analyze data by utilizing clustering and classification algorithms.
3. Learn and apply different mining algorithms and recommendation systems for large volumes of data.
4. Perform analytics on data streams.
5. Learn No SQL databases and management.

Text Books (In API Style)

1. Roger D.Peng,‖ R Programming for Data Science–,2012
2. Norman Matl off,‖ The Art of R Programming- A Tour of Statistical Software Design‖,2011

Supplementary Readings

1. Hadley Wickham,‖ Hands-On Programming with R:WriteYour Own Functions and Simulations‖, 1st Edition,2014

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**3**	**2**	**-**	**3**	**1**	**-**
CO2	**3**	**3**	**2**	**2**	**-**	**2**
CO3	**1**	**2**	**3**	**1**	**2**	**1**
CO4	**2**	**2**	**1**	**-**	**2**	**1**
CO5	**2**	**2**	**2**	**1**	**3**	**1**
Weightage of course contributed to each PSO	11	11	8	7	8	5

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:VI PART: III	Core - XV 23UBCAP63: R PROGRAMMING LAB (PRACTICAL)	CREDIT:4 HOURS:6

COURSE OBJECTIVES

1. To understand the problem solving approaches
2. To learn the basic programming constructs in R Programming
3. To practice various computing strategies for R Programming-based solutions to real world problems
4. To use R Programming data structures-lists, tuples ,and dictionaries.
5. To do input/output with files in R Programming

List of Programs:

1. Program To convert the given temperature from Fahrenheit to Celsius and vice versa depending Upon user‘s choice.
2. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user
3. Write a program to find list of even numbers from1to n using R-Loops.
4. Create a function to print squares of numbers in sequence
5. Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R(Vectors, Lists, Data Frames)
8. Write a program to read a csv file and analyze the data in the file in R.
9. Create pie chart and bar chart using R.
10. Program to find factorial of the given number using recursive function
11. Write a R program to count the number of even and odd numbers from array of N numbers

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	3	3	1	2
CO2	2	3	3	3	1	2
CO3	2	3	3	3	1	2
CO4	2	3	3	3	1	2
CO5	2	3	3	3	1	2
Weightage of course contributed toe ach PSO	11	15	15	15	5	10

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:VI PART: III	ELECTIVE –VII 23UBCAE64-1. ARTIFICIAL INTELLIGENCE	CREDIT:3 HOURS:5

COURSE OBJECTIVES

1. To learn various concepts of AI
2. To learn variousSearch Algorithm in AI Techniques.
3. To learn probabilistic reasoning and models in AI.
4. To learn about Markov Decision Process.
5. To learn various type of Reinforcement learning.

UNIT I : Introduction **Hours:10**

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT II: SearchAlgorithms **Hours:10**

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A*algorithm, Game Search.

UNIT III: Probabilistic Reasoning **Hours:10**

Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model,hidden Markov model

UNIT IV: MDPs **Hours:10**

Markov Decision process : MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT V: Reinforcement Learning **Hours:10**

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning-Q learning.

Course Outcomes

1. Understand the various concepts of AI Techniques.
2. Understand various Search Algorithm in AI.
3. Understand probabilistic reasoning and models in AI
4. Understand Markov Decision Process.
5. Understand various type of Reinforcement learning Techniques

Text Book:

1.StuartRusselland Peter Norvig,–Artificial Intelligence: A Modern Approach‖,3rd Edition, Prentice Hall.

2.ElaineRichandKevinKnight,–Artificial Intelligence‖, Tata McGraw Hill

Supplementary Reading

1.Trivedi,M.C.,–AClassical Approach to Artificial Intelligence, Khanna Publishing House, Delhi.

2. SarojKaushik,–ArtificialIntelligence‖,CengageLearningIndia,2011

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	**2**	**3**	**2**	**3**	**2**	**-**
CO2	**2**	**-**	**2**	**3**	**3**	**2**
CO3	**1**	**2**	**-**	**-**	**2**	**3**
CO4	**3**	**1**	**2**	**2**	**2**	**1**
CO5	**2**	**1**	**3**	**1**	**2**	**2**
Weightage of course contributed to each PSO	10	7	9	9	11	8

S-Strong-3 M-Medium-2 L-Low-1

SEMESTER:VI PART: III	ELECTIVE –VII 23UBCAE64-2.CLOUD COMPUTING	CREDIT:3 HOURS:5

COURSE OBJECTIVES

1. Learning fundamental concepts and Technologies of Cloud Computing.
2. Learning various cloud service types and their uses and pitfalls.
3. To learn about Cloud Architecture and Application design
4. To know thevarious aspects of application design,benchmarking and security on the Cloud
5. To learn the various CaseStudies in Cloud Computing.

UNIT I : **Introduction to Cloud Computing** **Hours:10**

Definition of Cloud Computing –Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples–Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing –Scalability and Elasticity – Deployment – Replication – Monitoring –Software Defined Networking– Network Function Virtualization–Map Reduce–Identity and Access Management– Service Level Agreements–Billing.

UNIT II: Cloud Services **Hours:10**

Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine-Windows Azure Virtual Machines-StorageServices:AmazonSimpleStorageService-GoogleCloudStorage-WindowsAzureStorage-Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database-Windows Azure Table Service-Application Services: Application Runtimes and Frameworks – Queuing Services-Email Services-Notification Services-Media Services—Content Delivery Services: Amazon Cloud Front-Windows Azure Content Delivery Network-Analytics Services: Amazon Elastic Map Reduce - Google Map Reduce Service-Google Big Query-Windows Azure HD Insight-Deployment and Management Services: Amazon Elastic Bean stack Amazon Cloud Formation-Identity and Access Management Services: Amazon Identity and Access Management-Windows Azure Active Directory Open Source Private Cloud Software: Cloud Stack– Eucalyptus –Open Stack

UNIT III: Cloud Application Design **Hours:10**

Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability–Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications–Cloud Application Design Methodologies: Service Oriented Architecture(SOA),Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services –Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach(NoSQL).

UNIT IV: Cloud Security **Hours:10**

Introduction – CSA Cloud Security Architecture – Authentication(SSO)– Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data inmotion – Key Management – Auditing.

UNIT V: Case Studies **Hours:10**

Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - CloudComputingforManufacturingIndustry-CloudComputingforEducation.

Course Outcomes

1. Understand the fundamental concepts and Technologies in Cloud Computing.
2. Able to understand various cloud service types and their uses and pitfalls.
3. Able to understand Cloud Architecture and Application design.
4. Understand the various aspects of application design, benchmarking and security in the Cloud.
5. Understand various Case Studies in Cloud Computing.

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, Cloud Computing–A Hands On Approach, Universities Press(India)Pvt.Ltd.,2018

Supplementary Reading

1. Anthony T Velte, TobyJ Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Tata McGraw-Hill,2013.
2. BarrieSosinsky, Cloud Computing Bible, Wiley IndiaPvt.Ltd.,2013

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**2**	**2**	**2**	**3**	**3**	**1**
CO2	**3**	**1**	**2**	**3**	**3**	**-**
CO3	**3**	**2**	**1**	**2**	**1**	**3**
CO4	**3**	**3**	**2**	**3**	**2**	**-**
CO5	**2**	**2**	**1**	**3**	**3**	**3**
Weightage of course contributed to each PSO	13	10	8	14	12	7

S-Strong-3 **M-Medium-2L-Low-1**

SEMESTER:VI PART: III	ELECTIVE –VIII 23UBCAE65-1.SOFTWARE PROJECT MANAGEMENT	CREDIT:3 HOURS:5

Course Objective:

1. To define and highligh timportance of software project management.
2. To learn the project process and planning.
3. To learn the project task and its ativities.
4. To learn the concept of project management
5. To learn the concept of quality asurance.

UNIT I : **Introduction** **Hours:10**

Introduction to Competencies - Product Development Techniques -Management Skills - Product Development Life Cycle – Software Development Process and models-The SEI CMM-International Organization for Standardization.

UNIT II: Introduction to Project **Hours:10**

Managing Domain Processes - Project Selection Models – Project Portfolio Management- Financial Processes- Selecting a Project Team - Goal and Scope of the Software Project -Project Planning -Creating the Work Breakdown Structure - Approaches to Building a WBS- Project Milestones-Work Packages-Building a WBS for Software.

UNIT III: Tasks and Activities **Hours:10**

Software Size and Reuse Estimating – The SEI CMM-Problems and Risks-Cost Estimation- Effort Measures- COCOMO :A Regression Model-COCOMOII -SLIM :A Mathematical Model-Organizational Planning-Project Roles and Skills Needed.

UNIT IV: Project management **Hours:10**

Project Management Resource Activities - Organizational Form and Structure - Software Development Dependencies - Brainstorming -Scheduling Fundamentals – PERT and CPM - Leveling Resource Assignments-Map the Schedule to a Real Calendar- Critical Chain Scheduling.

UNIT V: Quality **Hours:10**

Requirements – The SEI CMM - Guidelines - Challenges –Quality Function Deployment-Building the Software Quality Assurance - Plan - Software Configuration Management: Principles -Requirements-Planning and Organizing-Tools-Benefits-Legal Issues in Software-Case Study.

Course Outcomes

1, Understand the principles and concepts of project management
2.Knowledge gained to train software project managers
3. Apply software project management methodologies.
4. Able to create comprehensive project plans
5. Evaluate and mitigate risk associated with software development process

Text Book:

1. RobertT .Futrell, DonaldF. Shafer, LindaI. Safer,–Quality Software Project Management‖,PearsonEducationAsia2002.

Supplementary Reading

1. Pankaj Jalote,–Software Project Management in Practice‖,AddisonWesley2002
2. Hughes,–SoftwareProjectManagement‖,TataMcGrawHill2004,3rd Edition.

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	-	3	3	1
CO2	2	1	-	3	3	-
CO3	3	-	1	2	3	3
CO4	2	3	2	3	2	-
CO5	2	2	-	3	3	3
Weight age of course contributed To each PSO	11	8	3	14	14	7

SEMESTER:VI PART: III	ELECTIVE –VIII 23UBCAE65-2: CRYPTOGRAPHY	CREDIT:3 HOURS:5

Course Objective:

1. To understand the fundamentals of Cryptography.
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
3. To understand the various key distribution and management schemes.
4. To understand how to deploy encryption techniques to secure data in transit across

   Data networks

5. To design security applications in the field of Information technology

UNIT I : **Introduction** **Hours:10**

The OSI security Architecture – Security Attacks–Security Mechanisms Security Services– A model for network Security.

UNIT II: Encryption Techniques **Hours:10**

Symmetric cipher model –Substitution Techniques: Caesar Cipher–Mono alphabetic cipher–Play fair cipher–Poly Alphabetic Cipher–Transposition techniques–Stenography

UNIT III: BlockCipher and DES **Hours:10**

.Block Cipher Principles–DES–The Strength of DES–RSA**:** The RSA algorithm.

UNIT IV: .Network Security Practices **Hours:10**

IP Security overview-IP Security architecture–Authentication Header. Web Security: Secure Socket Layer and Transport Layer Security–Secure Electronic Transaction

UNIT V: Firewalls **Hours:10**

Intruders–Malicious software–Firewalls

Course Outcomes

1. Analyze vulnerabilities in any computing system and hence be able to design a security solution
2. Apply the different cryptographic operations of symmetric cryptographic algorithms
3. Apply the different cryptographic operations of public key cryptography
4. Apply the various Authentications schemes to simulate different applications.
5. Understand various Security practices and System security standards

Text book:

1. WilliamStallings**,**–CryptographyandNetworkSecurityPrinciplesandPractices

Supplementary Reading

1. BehrouzA.Foruzan**,**–CryptographyandNetworkSecurity‖,TataMcGraw-Hill, 2007..
2. AtulKahat**e**,–*CryptographyandNetworkSecurity*‖,SecondEdition,2003,TMH.

Mapping with Programme Outcomes:

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	3	3	1	2	3	2
CO2	3	2	3	2	3	3
CO3	2	3	2	2	2	1
CO4	2	3	3	1	2	3
CO5	3	2	3	3	3	3
Weight age of course contributed to each PSO	13	13	12	10	13	12

S-Strong-3 M-Medium-2L-Low-1

SEMESTER:VI PART: IV	PROFESSIONAL COMPETENCY SKILL: 23UBCAF66: BIG DATA ANALYTICS	CREDIT:1 HOURS:2

Pre-requisite	Basic knowledge on Data handlings
Learning Objectives: (for teachers: what they have to do in the class/lab/field) 1. To know the fundamental concepts of big data and analytics. 2. To explore tools and practices for working with big data.	
Course Outcomes: (for students: To know what they are going to learn) **CO1:**Work with big data tools and its analysis techniques. **CO2:** Analyze data by utilizing clustering and classification algorithms. **CO3:** Learn and apply different mining algorithms and recommendation systems for large volumes of data. **CO4:** Perform analytics on data streams. **CO5:** Learn NoSQL databases and management.	
Recap: (not for examination) Motivation/previous lecture/ relevant portions required for the course) [This is done during 2 Tutorial hours)	

Units	**Contents**	**Required Hours**
I	**INTRODUCTION TO BIG DATA :** Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model	**5**
II	**CLUSTERING AND CLASSIFICATION :**Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions .- Classification: Decision Trees —	**5**

	Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier	
III	**ASSOCIATION AND RECOMMENDATION SYSTEM:**Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation-Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches	**5**
IV	**STREAM MEMORY:** Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform(RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics	**5**
V	**NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION :**NoSQL Databases : Schema-less Models?: Increasing Flexibility for Data Manipulation-Key Value Stores-Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.	**5**
Extended Professional Component (is a part ofinternal component only, Not to be includedin the	Questions related to the above topics, from variouscompetitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved(To be discussed during the Tutorial hour)	

External Examination question paper)		
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

- **Recommended Texts**
  1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- **Reference Books**
  1. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.
  2. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

Web resources: Web resources from NDL Library, E-content from open-source libraries

PROGRAMME OUTCOMES AND COURSE OUTCOMES MAPPING TABLE

CO/PO	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	2	3
CO2	3	2	2	3	2
CO3	3	3	2	2	2
CO4	3	2	3	3	2
CO5	2	2	3	2	2

1-LOW 2- MODERATE 3-HIGH

SEMESTER:VI PART: V	23UBCAX67: EXTENSION ACTIVITY	CREDIT:2 HOURS:-

(Refer to the Regulations)