

MAHENDRA ARTS & SCIENCE COLLEGE

(AUTONOMOUS)

(Affiliated to Periyar University)

[Accredited by NAAC with “A++” Grade Recognized u/s 2(f) and 12(B) of the UGC act 1956]

KALIPPATTI-637501



BACHELOR OF COMPUTER APPLICATIONS

SYLLABUS FOR BCA

OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

**FOR THE STUDENTS ADMITTED FROM
THE ACADEMIC YEAR 2023 – 2024 ONWARDS**

MAHENDRA ARTS & SCIENCE COLLEGE
(Autonomous)
(Affiliated to Periyar University)

Department of Computer Science & Applications

REGULATIONS FOR BCA PROGRAMME
OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM
(Effective from the academic year 2023-2024)

I. PREAMBLE

BCA is a systematically designed three-year course that prepares the student for a career in software industry. The syllabus of Computer Applications subject along with that of two allied subjects Mathematics forms the required basics for pursuing higher studies in BCA. The syllabus also develops requisite professional skills and problem-solving abilities for pursuing a career in software industry.

II. GRADUATES ATTRIBUTES

- **In-depth knowledge and understanding of major concepts:** Understanding of theoretical principles and experimental findings in different sub-areas available in respective disciplines
- **Creative and Critical thinking:** The capability of using creative and critical thinking in respective areas
- **Analytical ability:** The ability to analyze issues and problems in all the disciplines
- **Problem-solving skills:** The capability towards solving problems
- **Entrepreneur skills:** The inclusion of leadership, business management, time management skills
- **Communication skills:** The ability to transfer complicated/technical information in a precise manner
- **Mutual and multidisciplinary competence:** The ability of teamwork in interdisciplinary fields
- **Digital literacy:** The capability of utilizing modern digital tools to carry out the simulation process
- **Moral and ethical awareness:** Ability to adopt moral ethics
- **Social responsibility:** Creating socially responsible citizens

III. PROGRAMME EDUCATIONAL OBJECTIVES

- Graduates will have successful careers in computer fields or will be able to successfully pursue higher studies.
- Graduates will apply their technical knowledge and skills to develop and implement solutions for the problems that accomplish goals to the Industry, Academic, Government or Research area.
- Contribute effectively to the computing profession by fostering effective interaction, ethical practices and communication skills, while pursuing education through lifelong learning.

IV. PROGRAMME OUTCOMES

1. Acquire scientific knowledge leading to creative thinking and research motivations.
2. Internalize the learned concepts and that will enable them to become skilled professionals.
3. Develop a sense of an interdisciplinary approach to identify and resolve issues through the project, seminars, fieldwork, internships, and industrial visits.
4. Become empowered individuals who will emerge as entrepreneurs or be employed in industry, academia, and Government sectors.
5. Establish a self-sustained environment for a healthy society.

V. PROGRAMME SPECIFIC OUTCOMES

PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline. After completing the BCA Programme, the graduates would have

1. Acquired the required knowledge in the Hardware and Software aspects of Computer Science domain and the art of programming.
2. Understood the development methodologies of software systems and the ability to analyze design and develop computer applications for real life problems.
3. Knowledge and skills to collaborate and communicate with peers for performance enhancement in IT / ITES industries.
4. Ability to understand, adjust and adapt with the dynamic technical environment for the growth of IT industry.
5. Capacity to transfer the skills gained, to provide innovative and novel solutions by maintaining ethical norms for the betterment of humane society.

VI. REGULATIONS

These regulations shall take effect from the academic year 2023-2024, i.e., for students who are to be admitted to the first year of the course during the academic year 2023-24 and thereafter.

1. Eligibility for Admission:

A candidate who has passed in Higher Secondary Examination with Mathematics or Business Mathematics or Computer Science or Statistics or Computer Applications (Academic stream or Vocational stream) as one of the subject under Board of Higher Secondary Examination, Tamil Nadu as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the syndicate, subject to such other conditions as may be prescribed, are permitted to appear and qualify for the BCA degree examination of this university, after a programme of study of three academic years.

2. Duration of the Programme:

The course of study of Bachelor of Computer Applications shall consist of three academic years divided into six semesters with 140 credits. The Programme of study will comprise the course according to the syllabus.

3. Programme of Study:

The programme of study for the UG degree has been divided into the following five categories:

Part-I : Tamil / Other Languages.

Part-II : English Language.

Part-III : Core Courses, Generic Elective, Discipline Specific Elective Courses, and Project with viva-voce.

Part-IV : Foundation Course, Skill Enhancement Courses (Non- Major Elective Course), Skill Enhancement Courses (Discipline Specific), Enhancement Compulsory Courses and Internship.

Part-V : Value added Courses, Extension Activity, etc.

4. Extension Activity:

Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the following programmes. NSS/ Sports/YRC/Other Extra-curricular and Co-curricular activities (Club/IIC/EDC). The student's performance shall be examined by the staff in-charge of extension activities along with the Head of the respective department and a senior member of the Department on the following parameters.

The marks shall be sent to the Controller of Examinations before the commencement of the final semester examinations.

20% of marks for Regularity of attendance.

60% of marks for Active Participation in classes/ camps/ games/ special Camps/ programmes in the college/ District/ State/ University activities.

10% of marks for Exemplary awards/ Certificates/ Prizes.

10% of marks for Other Social components such as Blood Donations, Fine Arts, etc.

The above activities shall be conducted outside the regular working hours of the college. The mark sheet shall carry the gradation relevant to the marks awarded to the candidates.

A - Exemplary - 80 and above

B - Very good - 70-79

C - Good - 60-69

D - Fair - 50-59 E - Satisfactory - 40 - 49

This grading shall be incorporated in the mark sheet to be issued at the end of the semester. (Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above fields and be graded and certified accordingly).

5. Examinations:

The programme of study shall be based on semester pattern with Internal Assessment under Choice Based Credit System.

The examinations for all the papers consist of both Internal (Continuous Internal Assessment - CIA) and External (End Semester) theory examinations. The theory examinations shall be conducted for three hours duration at the end of each semester. The candidates failing in any subjects(s) will be permitted to reappear for the same in the subsequent semester examinations.

VII. STRUCTURE OF THE PROGRAMME

SEMESTER: I

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	Tamil-I / Hindi-I / French-I	M23UFTA01/ M23UFHI01	6	-	3	25	75	100
II	LANGUAGE COURSE-II	English -I	M23UFEN01	6	-	3	25	75	100
III	CORE COURSE-I	Python Programming	M23UCA01	5	-	5	25	75	100
	CORE PRACTICAL - II	Practical - I Python Programming Lab	M23UCAP01	-	3	3	40	60	100
	GENERIC ELECTIVE COURSE	Elective - I - Generic Elective - Discrete Mathematics - I	M23UMAGE2	6	-	5	25	75	100
IV	SKILL ENHANCEMENT COURSE	SEC- I (NME-I) Aptitude for Competitive Examinations-I	M23UMAN01	2	-	2	25	75	100
	FOUNDATION COURSE	Structured Programming Language in C	M23UCAFC1	2	-	2	25	75	100
Total				27	3	23	190	510	700

SEMESTER: II

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	Tamil-II / Hindi-II / French-II	M23UFTA02/ M23UFHI02	6	-	3	25	75	100
II	LANGUAGE COURSE-II	English - II	M23UFEN02	6	-	3	25	75	100
III	CORE COURSE-III	Object Oriented Programming concepts using C++	M23UCA02	5	-	5	25	75	100
III	CORE PRACTICAL -IV	Practical- II C++ Programming Lab	M23UCAP02	-	3	3	40	60	100
III	GENERIC ELECTIVE COURSE	Elective - II - Generic Elective - Discrete Mathematics -II	M23UMAGE4	6	-	5	25	75	100
IV	SKILL ENHANCEMENT COURSE	SEC-II - (NME - II) Aptitude for Competitive Examinations-II	M23UMAN03	2	-	2	25	75	100
IV	SKILL ENHANCEMENT COURSE	SEC - III (Discipline Specific) Introduction to HTML	M23UCAS01	2	-	2	25	75	100
Total				27	3	23	190	510	700

SEMESTER: III

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	Tamil-III / Hindi-III / French-III	M23UFTA03 / M23UFFR03	6	-	3	25	75	100
II	LANGUAGE COURSE-II	English	M23UFEN03	6	-	3	25	75	100
III	CORE COURSE - V	Data Structures and Algorithms	M23UCA03	6	-	5	25	75	100
	CORE PRACTICAL - VI	Practical III : Data Structures and Algorithms using C++ Lab	M23UCAP03	-	3	3	40	60	100
	GENERIC ELECTIVE COURSE	Generic Elective - III-Optimization Techniques	M23UMAGE6	5	-	5	25	75	100
IV	SKILL ENHANCEMENT COURSE	SEC- IV (Entrepreneurial Based)PHP Programming	M23UCAS02	2	-	2	25	75	100
	SKILL ENHANCEMENT COURSE	SEC - V Multimedia Systems	M23UCAS03	2	-	2	25	75	100
Total				27	3	23	190	510	700

SEMESTER: IV

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
I	LANGUAGE COURSE-I	Tamil-IV / Hindi-IV / French-IV	M23UFTA04/ M23UFFR04	6	-	3	25	75	100
II	LANGUAGE COURSE-II	English - IV	M23UFEN04	6	-	3	25	75	100
III	CORE COURSE-VII	Industry Module - Programming in Java	M23UCA04	4	-	4	25	75	100
	CORE PRACTICAL - VIII	Practical -IV- Programming in Java Lab	M23UCAP04	-	3	3	40	60	100
	GENERIC ELECTIVE COURSE	Generic Elective - IV-Principles of Accountancy	M23UCCGE3	5	-	5	25	75	100
IV	SKILL ENHANCEMENT COURSE	SEC -VI Biometrics	M23UCAS04	2	-	2	25	75	100
	SKILL ENHANCEMENT COURSE	SEC -VII Web Designing	M23UCAS05	2	-	2	25	75	100
	ENHANCEMENT COMPULSORY COURSE	Environmental Studies	M23UES01	2	-	2	25	75	100
Total				27	3	24	215	585	800

SEMESTER: V

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
III	CORE COURSE- V	Operating Systems	M23UCA05	6	-	4	25	75	100
III	CORE COURSE-VI	ASP.Net Programming	M23UCA06	6	-	4	25	75	100
III	CORE PRACTICAL-V	Practical -V- ASP.Net Programming Lab	M23UCAP05	-	5	4	25	75	100
III	DISCIPLINE SPECIFIC ELECTIVE COURSE - I	-	M23UCADSE4	6	-	3	25	75	100
III	DISCIPLINE SPECIFIC ELECTIVE COURSE - II	-	M23UCADSE5	5	-	3	25	75	100
IV	VALUE EDUCATION	Value Education - Yoga	M23UVE01	2		2	25	75	100
	CORE INTERNSHIP	Internship / Industrial Training (Summer vacation at the end of IV semester activity)	M23UCAIS01	-	-	2	40	60	100
Total				25	5	22	190	510	700

SEMESTER: VI

Part	Course Category	Title of the Course	Course Code	Hrs/Week		No. of Credits	Max. Mark		
				L	P		Int.	Ext.	Total
III	CORE COURSE - VII	Computer Networks	M23UCA07	6	-	4	25	75	100
III	CORE COURSE-VIII	Data Analytics using R Programming	M23UCA08	5	-	4	25	75	100
III	CORE PRACTICAL -VI	Practical-VI- R Programming Lab	M23UCAP06	-	5	4	40	60	100
III	DISCIPLINE SPECIFIC ELECTIVE COURSE - III	-	M23UCADSE10	4	-	3	25	75	100
III	DISCIPLINE SPECIFIC ELECTIVE COURSE - IV	-	M23UCADSE14	4	-	3	25	75	100
III	PROJECT	PROJECT with Viva Voce	M23UCAPR1	4	-	4	40	60	100
IV	SKILL ENHANCEMENT COURSE	Professional Competency Skill Enhancement	M23UCAPCS1	2	-	2	25	75	100
	Extension Activity	Extension Activity	M23UEX01	-	-	1	-	-	-
Total				25	5	25	205	495	700
TOTAL				150	30	140	1180	3120	4300

*The students will gain extra credits for successful completion of online courses from SWAYAM / MOOC.

Summary of Credits, Hours and Mark Distribution

Part	Course Name	No. of Credits						Total Credits	Total Hours	No. of Courses	Max. Marks
		I	II	III	IV	V	VI				
I	Language Courses -I	3	3	3	3	-	-	12	24	04	400
II	Language Courses- II	3	3	3	3	-	-	12	24	04	400
III	Core courses	5	5	5	4	8	8	35	43	08	800
	Core Practical	3	3	3	3	4	4	20	22	06	600
	Discipline Specific Elective Courses	-	-	-	-	6	6	12	19	04	400
	Project/Internship					2	4	6	04	02	200
	Generic Elective Courses	5	5	5	5	-	-	20	22	04	400
IV	SEC	-	2	4	4	-	2	12	12	06	600
	Foundation Course	2	-	-	-	-	-	02	02	01	100
	SEC (NME)	2	2	-	-	-	-	04	04	02	200
	E C C	-	-	-	2	2	-	04	04	02	200
V	Extension Activities	-	-	-	-	-	01	01	-	-	-
		-	-	-	-	-	-	-	-	-	-
TOTAL		23	23	23	24	22	25	140	180	43	4300

GENERIC ELECTIVE COURSE SUBJECTS FOR BCA STUDENTS

Semester	Subject	Course Code
I	GEC - I - DISCRETE MATHEMATICS - I	M23UMAGE2
II	GEC - II - DISCRETE MATHEMATICS - II	M23UMAGE4
III	GEC - III - OPTIMIZATION TECHNIQUES	M23UMAGE6
IV	GEC - IV - PRINCIPLES OF ACCOUNTANCY	M23UCCGE3

DISCIPLINE SPECIFIC ELECTIVE SUBJECTS FOR BCA STUDENTS

Semester	ELECTIVE – I	
V	Course Title	Course Code
	Natural Language Processing	M23UCADSE1
	Database Management System	M23UCADSE2
	Computational Intelligence	M23UCADSE3
	Cryptography	M23UCADSE4
	ELECTIVE – II	
	Course Title	Course Code
	Artificial Intelligence	M23UCADSE5
	Analytics for Service Industry	M23UCADSE6
	Artificial Neural Network	M23UCADSE7
Image Processing	M23UCADSE8	
VI	ELECTIVE – III	
	Course Title	Course Code
	Agile Project Management	M23UCADSE9
	Big Data Analytics	M23UCADSE10
	Software Project Management	M23UCADSE11
	Human Computer Interaction	M23UCADSE12
	ELECTIVE – IV	
	Course Title	Course Code
	Cloud Computing	M23UCADSE13
	IOT and its Applications	M23UCADSE14
	Information Security	M23UCADSE15
	Grid Computing	M23UCADSE16

SKILL ENHANCEMENT COURSES (SEC - 1 - SEC - 5)

Course Title	Course Code
Introduction to HTML	M23UCAS01
PHP Programming	M23UCAS02
Multimedia Systems	M23UCAS03
Biometrics	M23UCAS04
Web Designing	M23UCAS05

ENHANCEMENT COMPULSORY COURSES

Semester	Course Title	Course Code
IV	ECC- I- Environmental studies	M23UES01
V	ECC- II -Value Education – Yoga	M23UVE01

VI. SCHEME OF EXAMINATION

1. Question Paper Pattern for Theory Examination

Time: Three Hours

Maximum Marks: 75

Knowledge Level	Sections	Marks	Total Marks	Meaning of K's
K1	Part - A 10 Questions - Objectives type *1 Marks (No Choice)	Two Questions from each unit	10	K1- Memory Level K2 - Understanding Level K3 - Application Level K4 - Analytical Level
K1, K2	Part - B 5 Questions *2 Marks (No Choice)	One Question from each unit	10	
K2, K3	Part - C 5 Questions (either or type) * 5 Marks	One Question from each unit	25	
K2, K3, K4	Part - D 3 out of 5 Questions *10 Marks	One Question from each unit	30	

2. Question Paper Pattern for Practical Examination

Time: Three Hours

Maximum Marks: 60

Two Major Questions from the List of Practical's each carry 30 Marks

- From the list of practical's 1, 2 and 3 (or)
- From the list of practical's 4 and 5.

(AND)

- From the list of practical's 6, 7 and 8 (or)
- From the list of practical's 9 and 10.

3. Distribution of Marks:

The following are the distribution of marks for external and internal for End Semester Examinations and continuous internal assessment and passing minimum marks for Theory / Practical / Internship / Project papers of UG programmes.

ESE	CIA Total	EA Total	Total Marks Allotted	Passing Minimum for EA	Passing Minimum (ESE)
Theory	25	75	100	30	40
Practical	40	60	100	24	40
Project	40	60	100	24	40
Internship	100	60	100	24	40

The following are the Distribution of marks for the Continuous Internal Assessment in Theory / Practical papers of UG programmes.

THEORY

EVALUATION OF INTERNAL ASSESSMENT

Test : 15 Marks
Assignment : 05 Marks
Marks Attendance : 05 Marks

Total : 25 Marks

PRACTICAL

EVALUATION OF INTERNAL ASSESSMENT

Test : 20 Marks
Attendance: 10 Marks
Record : 10 Marks

Total : 40 Marks

PROJECT

EVALUATION OF INTERNAL ASSESSMENT

Review 1 : 10 Marks
Review 2 : 10 Marks
Review 3 : 10 Marks
Pre-Viva : 10 Marks

Total : 40 Marks

4. Passing Minimum:

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Theory Exam mark) with minimum of 30 marks (out of 75 marks) in the End Semester Theory Examinations.

The Candidates shall be declared to have passed the examination if he/she secures not less than 40 marks in total (CIA mark + Practical Exam mark) with minimum of 24 marks (out of 60 marks) in the End Semester Practical Examinations.

5. Submission of Record Note Books for Practical Examinations

Candidates appearing for practical examinations should submit a bonafide record note books prescribed for practical examinations. The candidates failed to submit the record book shall not be permitted to appear for the practical examinations.

6. Internship/Project: Internship

Internship training (Minimum two weeks period) for the UG programmes during second year vacation period.

The Internship training Report should be valued for 60 marks by an External examiner; however the Viva-Voce examination should be conducted by both the external examiner appointed by the College and the internal examiner / guide/ teacher concerned.

- a. The Internship training Report may consist of minimum of 30 pages.
- b. The candidate must submit the Internship training Report 20 days before the commencement of the V Semester Examinations.

Project:

The following guidelines to be followed for the Project with Viva- voce:

The project should be valued for 60 marks by an external examiner, however the Viva-Voce examination should be conducted by both the external examiner appointed by the College and the internal examiner / guide/ teacher concerned.

1. The Project Report may consist of minimum of 60 pages.
2. The candidate must submit the Project Report 10 days before the commencement of the VI Semester Examinations.
3. A candidate who fails in the Project/Dissertation or is absent may resubmit the report, on the same topic, with necessary modification / correction / improvements in the subsequent Even Semester Examinations for evaluation and shall undergo viva-voce Examination.

VII. NOTE

a) SWAYAM / MOOC – Free Online Course

SWAYAM / MOOC is an instrument for self-actualization providing opportunities for a life-long learning. Here the student can choose from hundreds of courses, virtually every course taught at the college level, offered by the best teachers in India and elsewhere. The students can choose an online SWAYAM / MOOC course during their period of study which will earn an extra credit and it will be transferred to the academic records of the students.

b) Value Added Courses

Students are provided with additional courses during their course of study right from the First year. Students are free to choose the courses. On successful completion of each course, the students will gain one extra credits.

SEMESTER – I

Core Course- I	BCA	Credits : 5
Course code: M23UCA01	PYTHON PROGRAMMING	Contact Hours per week : 5

Objectives

- To understand the concepts of Python programming.
- To apply the OOPs concept in PYTHON programming.
- To impart knowledge on demand and supply concepts.
- To learn best practices in PYTHON programming.
- To know the costs and profit maximization.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	K1
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	K2
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	K3
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	K4
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	K3

UNIT I

15 Hours

Basics of Python Programming: 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**15 Hours**

Control Statements: 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**15 Hours**

Functions: 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**15 Hours**

Lists: 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**15 Hours**

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

Text Books

S.No	Author	Title of the book	Publisher	Year of publication
1.	Reema Thareja,	Python Programming using problem solving approach	Oxford University Press	2017
2	Dr. R. Nageswara Rao	Core Python Programming	Dream tech Publishers.	2017
Reference Books				
1.	VamsiKurama,	Python Programming: A Modern Approach	Pearson Education	2009
2.	Mark Lutz	Learning Python	Orielly	2010
3.	Adam Stewarts	Python Programming		2018
4.	Fabio Nelli	Python Data Analytics	APress	2019

Mapping with Programme Specific Outcomes

CO's / PSO's	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	M	S	S
CO 2	M	S	M	S	M
CO 3	S	M	M	M	M
CO 4	S	M	S	S	M
CO 5	S	M	M	S	S

S-Strong M-Medium

SEMESTER – I

Core Practical - I	BCA	Credits : 3
Course code: M23UCAP01	PYTHON PROGRAMMING LAB	Contact Hours per week : 3

Objectives

- To able to design and program Python applications.
- To able to create loops and decision statements in Python.
- To able to work with functions and pass arguments in Python.
- To able to build and package Python modules for reusability.
- To able to read and write files in Python.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language	K3 & K4
CO2	Identify the problem and solve using PYTHON programming techniques.	
CO3	Identify suitable programming constructs for problem solving.	
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.	
CO5	Develop a PYTHON program for a given problem and test for its correctness.	

List of Practical's:

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.

SEMESTER – I

Foundation Course	BCA	Credits : 2
Course code: M23UCAFC1	STRUCTURED PROGRAMMING LANGUAGE IN C	Contact Hours per week : 2

Objectives

- To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations.
- To understand the concept using if statements and loops
- To this unit covers the concept of Arrays
- To this unit covers the concept of Functions.
- To understand the concept of implementing pointers.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the program structure of C with its syntax and semantics	K1
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	K2
CO3	Apply the programming principles learnt in real-time problems	K3
CO4	Analyze the various methods of solving a problem and choose the best method	K4
CO5	Code, debug and test the programs with appropriate test cases	K3

UNIT I

6 Hours

Overview of C: 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

6 Hours

Decision Making and Branching: 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**6 Hours**

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

UNIT IV**6 Hours**

Functions: 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**6 Hours**

Pointers: 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.

Text Book				
S.No	Author	Title of the book	Publisher	Year of publication
1.	E. Balagurusamy	Programming in ANSI C	Tata McGraw-Hill	2010
Reference Books				
1.	Byron Gottfried	Schaum's Outline Programming with C	Tata McGraw-Hill	2018
2.	Kernighan and Ritchie	The C Programming Language	Prentice Hall	1998
3.	Yashavant Kanetkar	Let Us C	BPB Publications	2021

Mapping with Programme Specific Outcomes

CO's/ PSO's	PSO1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	M	S	M	M
CO 2	M	M	S	S	S
CO 3	M	M	M	M	M
CO 4	S	M	S	M	M
CO 5	M	S	S	S	S

S-Strong M-Medium

SEMESTER – II

Core Course- II	BCA	Credits : 5
Course code: M23UCA02	OBJECT ORIENTED PROGRAMMING CONCEPTS USING C++	Contact Hours per week : 5

Objectives

- To describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- To understand dynamic memory management techniques using pointers, constructors, destructors, etc
- To describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- To classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- To demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the program structure of C with its syntax and Semantics	K1
CO2	Summarize the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	K2
CO3	Illustrate the programming principles learn in real-time problems	K3
CO4	Classify the various methods of solving a problem and choose the best method	K4
CO5	Design the Code, debug and test the programs with appropriate testcases	K1

UNIT I

15 Hours

Introduction to C++ - 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 – Function Overloading.

UNIT II

15 Hours

Classes and Objects: 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

15 Hours

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

UNIT IV

15 Hours

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

UNIT V

15 Hours

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

Text Book				
S.No`	Author	Title of the book	Publisher	Year of publication
1.	E. Balagurusamy	Object-Oriented Programming with C++	Tata McGraw-Hill	2013
Reference Books				
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 Specific Outcomes

CO's/ PSO's	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	M	S	S	S	M
CO 3	S	M	M	M	S
CO 4	M	M	S	M	M
CO 5	S	M	S	M	M

S-Strong M-Medium

SEMESTER – II

Core Practical - II	BCA	Credits : 3
Course code: M23UCAP02	C++ PROGRAMMING LAB	Contact Hours per week : 3

Objectives

- To describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- To understand dynamic memory management techniques using pointers, constructors, destructors, etc
- To describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- To classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- To demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recite the program structure of C with its syntax and semantics	K3 & K4
CO2	Summarize the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	
CO3	Demonstrate the programming principles learnt in real-time problems	
CO4	Categorize the various methods of solving a problem and choose the best method	
CO5	Modify the Code, debug and test the programs with appropriate test cases	

List of Practical's:

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 Constructor and Destructor
5. Write a C++ program to demonstrate Unary Operator Overloading

6. Write a C++ program to demonstrate Binary Operator Overloading
7. Write a C++ program to demonstrate:
 - Single Inheritance
 - Multilevel Inheritance
 - Multiple Inheritance
 - Hierarchical Inheritance
 - Hybrid Inheritance
8. Write a C++ program to demonstrate Virtual Functions
9. Write a C++ program to manipulate a Text File.
10. Write a C++ program to find the Biggest Number using Command Line Arguments
11. Write a C++ program to demonstrate Class Template
12. Write a C++ program to demonstrate Function Template
13. Write a C++ program to demonstrate Exception Handling.

SEMESTER – II

SEC - III	BCA	Credits : 2
Course code: M23UCAS01	SEC- III INTRODUCTION to HTML	Contact Hours per week : 2

Objectives

- Insert a graphic with in a webpage.
- Create a link with in a webpage.
- Create a table with in a webpage.
- Insert heading levels within a webpage.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recall the basic concept in HTML	K3
CO2	Understand the concept to save the files	K4
CO3	Demonstrate the page formatting.	K3
CO4	Creating Links know the concept of creating link to email address	K3
CO5	Design the concept of adding images	K4

UNIT I

6 Hours

Introduction: Web Basics: What are Internet– Web browsers –What is Webpage – HTML Basics: Understanding tags.

UNIT II

6 Hours

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

UNIT III

6 Hours

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

UNIT IV

6 Hours

Tables: Creating basic Table, Table elements, Caption–Table and cell alignment – Row span, Cols pan –Cell padding.

UNIT V

6 Hours

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

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Samaneh Mazidi sharaf	Mastering HTML5 and CSS3 Made Easy	Teach U Comp In	2014
2.	Thomas Michaud	Foundations of Web Design: Introduction to HTML & CSS	-	-

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S
CO2	S	M	M	S	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	M	M	S	S

S- Strong M-Medium

SEMESTER – III

Core Course- III	BCA	Credits : 5
Course code: M23UCA03	DATA STRUCTURES AND ALGORITHMS	Contact Hours per week : 6

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	K2
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	K2
CO3	Identify the hash function and concepts of collision and its resolution methods	K1
CO4	Solve problem involving graphs, trees and heaps	K4
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	K3

UNIT I

18 Hours

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

UNIT II

18 Hours

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

UNIT III

18 Hours

Tree ADT - tree traversals – 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**18 Hours**

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

UNIT V**18 Hours**

Searching - Linear search-Binary search-Sorting-Bubble sort - Selection sort – Insertion sort-Shell sort – Radix sort-Hashing – Hash functions - Separate chaining - Open Addressing - Rehashing Extendible Hashing..

Text Books				
S.No`	Author	Title of the book	Publisher	Year of publication
1.	Mark Allen Weiss,	Data Structures and Algorithm Analysis in C++	Pearson Education	2014
2.	Reema Thareja	Data Structures Using C	Oxford Universities Press	2014
Reference Books				
1.	Thomas H.Cormen,Chales E.Leiserson,Ronald L.Rivest, Clifford Stein	Introduction to Algorithms	McGraw Hill C	2009
2.	Aho, Hopcroft and Ullman	Data Structures and Algorithms	Pearson Education	2003

Mapping with Programme Specific Outcomes

CO's/ PSO's	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	S	S	S	M	S
CO 2	M	S	S	S	M
CO 3	S	M	M	M	S
CO 4	M	M	S	M	M
CO 5	S	M	S	M	M

S-Strong M-Medium

SEMESTER – III

Core Practical - IV	BCA	Credits : 3
Course code: M23UCAP03	PRACTICAL – II : DATA STRUCTURES AND ALGORITHMS USING C++	Contact Hours per week : 3

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	K3 & K4
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	
CO3	Apply the hash function and concepts of collision and its resolution methods	
CO4	Solve problem involving graphs, trees and heaps	
CO5	Demonstrate the Algorithm for solving problems like sorting, searching, insertion and deletion of data	

List of Practical's

Implement the following exercises using C Programming language:

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).Linked list implementation of stacks.
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 program for the implementation of BFS and DFS for a given graph.
8. Write programs for implementing the following searching methods:
 - Linear search
 - Binary search.
9. Write programs for implementing the following sorting methods:
 - Bubble sort
 - Selection sort
 - Insertion sort
 - Radix sort

SEMESTER – III

SEC - IV	BCA	Credits : 2
Course code: M23UCAS02	SEC- IV PHP PROGRAMMING	Contact Hours per week : 2

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recognize PHP scripts to handle HTML forms	K1
CO2	Explain regular expressions including modifiers, operators, and meta characters.	K2
CO3	Illustrate PHP Program using the concept of array	K3
CO4	Develop PHP programs that use various PHP library functions	K4
CO5	Derive files and directories	K1

UNIT I

6 Hours

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

UNIT II

6 Hours

PHP Programming Basics -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

6 Hours

Switch () Statements -Using the while () Loop -Using the for() Loop PHP 6 Functions. PHP Functions -Creating an Array -Modifying Array Elements - Processing Arrays with Loops - Grouping Form Selections with Arrays -Using Array Functions.

UNIT IV

6 Hours

PHP Advanced Concepts -Reading and Writing Files -Reading Data from a File.

UNIT V**6 Hours**

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

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Lynn mighley and Michael Morrison.	Head First PHP & MySQL: A Brain-Friendly Guide	-	2009
2.	Alan Forbes	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL	-	-
Reference Books				
1.	Steven Holzner	PHP: The Complete Reference	-	-
2.	DT Editorial Services	HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)	Paperback	2016, 2 nd Edition.

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	S	M	S	S
CO2	S	M	M	S	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	M	M	S	S

S- Strong M-Medium

SEMESTER – III

SEC -V	BCA	Credits : 2
Course code: M23UCAS03	SEC – V MULTIMEDIA SYSTEMS	Contact Hours per week : 2

Objectives

- To understand the basics of Multimedia.
- To study about the Image File Formats, Sounds Audio File Formats.
- To understand the concepts of Animation and Digital Video containers.
- To study about the Stage of Multimedia Project
- To understand the concept of Ownership of Content Created for Project Acquiring Talent.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recite the application and the process of developing multimedia	K1
CO2	Explain image related processing	K2
CO3	Illustrate the Vaughan's Law of Multimedia Minimum.	K4
CO4	Apply t the stages of Multimedia Project.	K3
CO5	Generate the concept of cost involved in multimedia planning, designing, and producing.	K4

UNIT -I

6 Hours

Multimedia Definition-Use of Multimedia Delivering Multimedia- **Text:** About Fonts and Faces - Using Text in Multimedia -Computers and Text Font Editing and Design Tools Hypermedia and Hypertext.

UNIT-II

6 Hours

Images: 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

6 Hours

Animation: 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

6 Hours

Making Multimedia: The Stage of Multimedia Project - The Intangible Needs -The Hardware Needs - The Software Needs - An Authoring Systems Needs Multimedia Production Team.

UNIT V

6 Hours

Planning and Costing: The Process of Making Multi media-Scheduling- Estimating - RFPs and Bid Proposals. Designing and Producing - Content and Talent: Acquiring Content Ownership of Content Created for Project Acquiring Talent.

Text Book				
S.No	Author	Title of the book	Publisher	Year of publication
1.	TayVaughan	Multimedia: Making It Work	Osborne/Mc Graw Hill	8thEdition 2001
Reference Book				
1.	Ralf Steinmetz & Klara	Multimedia Computing, Communication & Applications Nahrstedt	Pearson Education,	2012

Mapping with Programme Specific Outcomes

Co's /PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	S	M	S	S	M
CO3	S	M	M	S	S
CO4	M	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M**-Medium

SEMESTER – IV

Core Course - IV	BCA	Credits : 4
Course code: M23UCA04	PROGRAMMING IN JAVA	Contact Hours per week : 4

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the basics of Object-oriented concepts. Implement the basic constructs of Core Java.	K1
CO2	Give example of inheritance, packages, interfaces and exception handling of Core Java.	K2
CO3	Design multi-threading and I/O Streams of Core Java.	K4
CO4	Use AWT and Event handling.	K3
CO5	Derive Swing to create GUI.	K4

UNIT I

12 Hours

Introduction :Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture – Data types - Variables - Scope and life time 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

12 Hours

Inheritance: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final 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**12 Hours**

Multithreaded Programming: Thread Class - Run able 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**12 Hours**

Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.

UNIT V**12 Hours**

Swing: 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.

Text Books				
S.No	Author	Title of the book	Publisher	Year of publication
1.	Herbert Schildt,	The Complete Reference,	Tata McGraw Hill, New Delhi	7th Edition, 2010
2.	Gary Cornell	Core Java 2 Volume I – Fundamentals	Addison Wesley,	1999
Reference Book				
1.	Y. Daniel Liang	Introduction to Java Programming	Pearson Education India	7th Edition, 2010

Mapping with Programme Specific Outcomes

Co's /PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	S	M	S	S	M
CO3	S	M	M	S	S
CO4	M	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium

SEMESTER – IV

Core Practical -IV	BCA	Credits : 3
Course code: M23UCAP04	PRACTICAL –IV PROGRAMMING IN JAVA LAB	Contact Hours per week : 3

Objectives

- To provide fundamental knowledge of object-oriented programming.
- To equip the student with programming knowledge in Core Java from the basics up.
- To enable the students to know about Event Handling.
- To enable the students to use String Concept.
- To equip the student with programming knowledge in to create GUI using AWT controls.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge level
CO1	Outline the basic Object-oriented concepts. Implement the basic constructs of Core Java.	K3 & K4
CO2	Give example of inheritance, packages, interfaces and exception handling of Core Java.	
CO3	Design multi-threading and I/O Streams of Core Java.	
CO4	Use AWT and Event handling.	
CO5	Derive Swing to create GUI.	

List of Practical's:

1. Write a 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:
 - a. String length

- b. Finding a character at a particular position
 - c. Concatenating two string
6. Write a program to perform the following string operations using String class:
 - a. String Concatenation
 - b. Search a substring
 - c. To extract substring from given string
7. Write a program to perform string operations using String Buffer class:
 - a. Length of a string
 - b. Reverse a string
 - c. Delete a substring from the given string
8. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
9. Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.
10. Write a program to demonstrate the use of following exceptions.
 - a. Arithmetic Exception
 - b. b. Number Format Exception
 - c. c. Array Index Out of Bound Exception
 - d. d. Negative Array Size Exception
11. Write a Java program that reads on file name from the user, and 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.
12. Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.
13. 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).
14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
15. 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.

SEMESTER –IV

SEC- VI	BCA	Credits : 2
Course code: M23UCAS04	SEC- VI - BIOMETRICS	Contact Hours per week : 2

Objectives

- To identify the various biometric technologies.
- To design of biometric recognition.
- To develop simple applications for privacy
- To understand the need of biometric in the society
- To understand the scope of biometric techniques

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Classify the functionality of Biometrics, Face Biometrics, Types, Architecture and Applications.	K1
CO2	Relate the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	K2
CO3	Determine the privacy enhancement and Multimodal Biometrics.	K3
CO4	Illustrate the analytical idea on Watermarking Techniques	K4
CO5	Discuss the Future scope of Biometrics, and Study of various Biometric Techniques.	K2

UNIT I

6 Hours

Introduction: What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of biometric system, Applications of biometrics, Biometrics versus traditional authentication methods.

Face Biometrics: Introduction, Background of Face Recognition, Design of Face Recognition System, Neural Network for Face Recognition, Face Detection in 6 Video Sequences, Challenges in Face Biometrics, .7 Face Recognition Methods, Advantages and Disadvantages.

UNIT II

6 Hours

Retina and Iris Biometrics: Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Iris Segmentation Method, Determination of Iris Region, Determination of Iris Region, Applications of Iris Biometrics, Advantages and Disadvantages

Vein and Fingerprint Biometrics: Introduction, Biometrics Using Vein

Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Minutiae Extraction, Fingerprint Indexing, Experimental Results, Advantages and Disadvantages.

UNIT III

6 Hours

Privacy Enhancement Using Biometrics: Introduction, Privacy Concerns Associated with Biometric Deployments, Identity and Privacy, Privacy Concerns, Biometrics with Privacy Enhancement, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics.

Multimodal Biometrics: Introduction to Multimodal Biometrics, Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics.

UNIT IV

6 Hours

Watermarking Techniques: Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking, Attacks on Watermarks, Performance Evaluation, Characteristics of Watermarks, General Watermarking Process, Image Watermarking Techniques, Watermarking Algorithm, Experimental Results, Effect of Attacks on Watermarking Techniques, Attacks on Spatial Domain Watermarking.

UNIT V

6 Hours

Scope and Future: Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques.

Biometric Standards: Introduction, Standard Development Organizations, Application Programming Interface (API), Information Security and Biometric 6 Standards, Biometric Template Interoperability.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	G.R Sinha and SandeepB	Biometrics: Concepts and Applications	Wiley	2013

References Books

1.	Ruud M. Bolle Sharath Pankanti, Nalinik.Ratha	Guide to Biometrics	Springer	2009
2.	Anil k. Jain, Arun A. Ross, Karthik Nandakumar	Introduction to Biometrics	-	2014

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	M	M	M	M
CO2	M	M	M	M	M
CO3	M	S	M	M	M
CO4	M	M	S	M	M
CO5	M	M	M	M	M

S - Strong M - Medium

SEMESTER – IV

SEC-VII	BCA	Credits : 2
Course code: M23UAS05	SEC –VII WEB DESIGNING	Contact Hours per week : 2

Objectives

- To understand the basics of HTML and its components.
- To study about the Graphics in HTML.
- To understand and apply the concepts of XML and DHTML
- To understand the concept of JavaScript
- To identify and understand the goals and objectives of the Ajax

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember the basic HTML tags.	K1
CO2	Describe the ability to develop and publish Web pages using Hypertext Markup Language (HTML).	K2
CO3	Use page styles and layout with Cascading Style Sheets (CSS).	K3
CO4	Apply client side scripting using java script.	K3
CO5	Design forms and validations.	K4

UNIT I

6 Hours

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

UNIT II

6 Hours

Forms & Images Using Html: 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

6 Hours

XML & DHTML: 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

6 Hours

Dynamic HTML: 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

6 Hours

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

Text Books				
S.No	Author	Title of the book	Publisher	Year of publication
1.	Pankaj Sharma	Web Technology	SkKataria & Sons Bangalore	2011
2.	Mike Mcgrath	Java Script	Dream Tech Press	2006, 1st Edition
3.	Achyut S Godbole & AtulKahate	Web Technologies	-	2002, 2nd Edition
Reference Books				
1.	Laura Lemay, Rafe Colburn , Jennifer Kyrnin	Mastering HTML, CSS & Java script	Web Publishing	4th Edition
2.	DT Editorial Services	HTML 5 Black Book (Covers CSS3 JavaScript, XML, XHTML, AJAX, PHP, j Query	Paperback	2010

Mapping with Programme Specific Outcomes

Co's /PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	S	M	S	S	M
CO3	S	M	M	S	S
CO4	M	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium

SEMESTER – V

Core Course –V	BCA	Credits : 4
Course code: M23UCA05	OPERATING SYSTEMS	Contact Hours per week : 6

Objectives

- To understanding the design of the Operating System
- To imparting knowledge on CPU scheduling, Process and Memory Management.
- To code specialized programs for managing overall resources and operations of the computer.
- To study about the concept of Job and processor scheduling.
- To learn about the concept of memory organization and multiprogramming.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the fundamental concepts of an OS and their respective functionality.	K1
CO2	Illustrate the importance of open source operating system commands.	K4
CO3	Identify and stimulate management activities of operating system.	K3
CO4	Analyze the various services provided by the operating system.	K2
CO5	Interpret different problems related to Process, Scheduling, Deadlock, memory and Files.	K3

UNIT I

18 Hours

Introduction: Definition of Operating System - **OS Structures:** OS Services - System Calls - Virtual Machines - **Process Management:** Process Concept - Process Scheduling - Operation on Processes - Co-operating Processes - Inter-process Communication.

UNIT II

18 Hours

CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - **Process Synchronization:** The Critical Section Problem - Semaphores - Classical Problems of Synchronization - Critical Regions.

UNIT III

18 Hours

Deadlocks: System Model - Deadlock characterization – Methods for Handling Deadlocks Deadlock Prevention - Deadlock avoidance- Deadlock Detection - Recovery from Deadlock.

UNIT IV**18 Hours**

Storage management: Memory management - Swapping – Contiguous Memory allocation. Paging – Segmentation – Segmentation with Paging –

Virtual memory: Demand paging - Page replacement – Thrashing. Mass-

Storage Structure: Disk Structure- Disk scheduling

UNIT V**18 Hours**

File-System Interface: File Concept-File Attributes-File Operations –

Access Methods: Sequential Access – Direct Access –**Directory Structure:**

Single-Level Directory- Two –Level Directory-Tree-Structured Directories-

Introducing Shell Programming – Linux General Purpose Commands-Process

Oriented Commands – Communication Oriented Commands.

Text Book				
S.No	Author	Title of the book	Publisher	Year of publication
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	Operating System Concepts	Wiley Student Edition	9th edition 2012
2.	B.Mohamed Ibrahim,	Linux Practical Approach	Firewall Media	2005
Reference Books				
1.	Milan Milenkovic	Python Programming A Modern Approach	McGraw Hill	2003
2.	Andrew S. Tanenbaum,	Operating System Concepts and Design - Modern Operating Systems	Prentice Hall of India.	2nd Edition 2001
3.	Deital and Deital	Introduction to Operating Systeml, Pearson Education	APress	1990

Mapping with Programme Specific Outcomes

Co's /PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	S	M	S
CO2	S	M	S	S	M
CO3	S	M	M	S	S
CO4	M	S	S	M	S
CO5	S	S	M	S	M

S- Strong; **M-**Medium

SEMESTER – V

Core Course - VI	BCA	Credits : 4
Course code: M23UCA06	ASP.NET PROGRAMMING	Contact Hours per week : 6

Objectives

- To identify and understand the goals and objectives of the .NET framework and ASP.NET with C# language.
- To develop ASP.NET Web application using standard controls.
- To implement file handling operations..
- To handles SQL Server Database using ADO.NET.
- To understand the Grid view control and XML classes..

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Develop working knowledge of C# programming constructs and the .NET Framework	K1
CO2	Develop a software to solve real-world problems using ASP.NET	K2
CO3	Classify the Various Controls Files	K4
CO4	Create a web application using MicrosoftADO.NET.	K3
CO5	Build web applications using XML.	K1

UNIT I

18 Hours

Overview of .NET framework: 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

18 Hours

Introduction to ASP.NET - 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

18 Hours

Rich Controls: 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

18 Hours

ADO.NET Overview – Database Connections – Commands – Data

Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding.

UNIT V

18 Hours

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

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	SvetlinNakov, VeselinKolev & Co,	Fundamentals of Computer Programming with C#	Prentice-Hall of India	2019
2.	Mathew, Mac Donald	The Complete Reference ASP.NET	Tata McGraw-Hill	2015
Reference Books				
1.	Herbert Schildt	The Complete Reference C#.NET	Tata McGraw Hill	2017
2.	Kogent Learning Solutions	C# 2012 Programming Covers .NET 4.5	Dream tech pres	2013
3.	Anne Boehm, Joel Murach,	Murach’s C# 2015, Mike Murach& Associates	PHI	2016
4.	Denielle Otey, Michael Otey	The Complete reference ADO.NET	Tata McGraw-Hill	2008
5.	Matthew MacDonald	Beginning ASP.NET 4 in C# 2010	APRESS	2010

Mapping with Programme Specific Outcomes:

CO's/PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

Core Practical - V	BCA	Credits : 4
Course code: M23UCAP05	PRACTICAL –V ASP .NETPROGRAMMING LAB	Contact Hours per week : 5

Objectives

- To develop ASP.NET Web application using standard controls..
- To create rich database applications usingADO.NET.
- To implement file handling operations.
- To implement XML classes.
- To utilize ASP.NET security features for authenticating the website.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge level
CO1	Develop working knowledge of C# programming constructs and the .NET Framework	K3 & K4
CO2	Develop a software to solve real-world problems using ASP.NET	
CO3	Classify the Various Controls Files	
CO4	Create a web application using MicrosoftADO.NET.	
CO5	Build web applications using XML.	

List of Practical's:

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 to 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.

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - I	BCA	Credits :3
Course code: M23UCADSE1	NATURAL LANGUAGE PROCESSING	Contact Hours per week : 6

Objectives

- To understand approaches to syntax and semantics in NLP.
- To learn natural language processing and to learn how to apply basic algorithms in this field.
- To understand approaches to discourse, generation, dialogue and summarization within NLP.
- To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc..
- To understand current methods for statistical approaches to machine translation.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Recite the fundamental concepts and techniques of natural language processing.	K1
CO2	Use NLP technologies to explore and gain a broad understanding of text data.	K2
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions.	K3
CO4	Analyze large volume text data generated from a range of real-world applications.	K4
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.	K3

UNIT I

18 Hours

Introduction : Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue- Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.

UNIT II

18 Hours

Word level and Syntactic Analysis: Word Level Analysis: Regular Expressions Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar-Constituency- Parsing-Probabilistic Parsing..

UNIT III**18 Hours**

Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution-Discourse Coherence and Structure.

UNIT IV**18 Hours**

Natural Language Generation: Architecture of NLG Systems-Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

UNIT V**18 Hours**

Information retrieval and lexical resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame Net Stemmers- POS Tagger- Research Corpora SSAS. cost.

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Daniel Jurafsky, James H. Martin	Speech & language processing	Pearson publications	-
2.	Allen, James.	Natural language understanding	Pearson	1995
Reference Book				
1.	Pierre M. Nugues	An Introduction to Language Processing with Perl and Prolog	Springer	-

Mapping with Programme Specific Outcomes:

CO's/PS O's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - I	BCA	Credits : 3
Course code: M23UCADSE2	DATABASE MANAGEMENT SYSTEM	Contact Hours per week : 5

Objectives

- To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.
- To understand the concepts of data base management system, design simple Database models
 - Model a reliable and cost-effective software system
 - Ability to design an effective model of the system.
 - Perform Testing at various levels and produce an efficient system.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	K1
CO2	Generate the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	K2
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML).	K3
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	K4
CO5	Design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions.	K2

UNIT I

15 Hours

Database Concepts: 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**15 Hours**

Design Concepts: Relational database model - logical view of data-keys - Integrity 15 rules - relational set operators - data dictionary and the system catalog - relationships - data redundancy revisited - indexes - cod's rules. Entity relationship model - ER diagram.

UNIT III**15 Hours**

Normalization of Database Tables: 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**15 Hours**

Advanced SQL: Relational SET Operators: UNION – UNION ALL – INTERSECTS - 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**15 Hours**

PL/SQL: 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.

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Coronel, Morris, Rob	Database Systems, Design, Implementation and Management	Prentice-Hall of India	Ninth Edition
2.	Nilesh Shah	Database Systems Using Oracle	Pearson Education India	2nd edition, 2016
Reference Book				
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan	Database System Concepts	McGraw Hill International Publication	VI Edition

Mapping with Programme Specific Outcomes:

CO's/P SO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - I	BCA	Credits : 3
Course code: M23UCADSE3	COMPUTATIONAL INTELLIGENCE	Contact Hours per week : 6

Objectives

- To identify and understand the basics of AI and its search.
- To study about the Fuzzy logic systems.
- To understand and apply the concepts of Neural Network and its functions.
- To understand the concepts of Artificial Neural Network
- To study about the Genetic Algorithm.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the fundamentals of artificial intelligence concepts and searching techniques.	K4
CO2	Develop the fuzzy logic sets and membership function and defuzzification techniques.	K1
CO3	Understand the concepts of Neural Network and analyze and apply the learning techniques.	K2
CO4	Paraphrase the artificial neural networks and its applications.	K3
CO5	Illustrate the concept of Genetic Algorithm and Analyze the optimization problems using GAs.	K4

UNIT I

18 Hours

Introduction to AI: Problem formulation – AI Applications – Problems – State Space and Search – Production Systems – Breadth First and Depth First – Travelling Salesman Problem – Heuristic search techniques: Generate and Test – Types of Hill Climbing.

UNIT II

18 Hours

Fuzzy Logic Systems: Notion of fuzziness – Operations on fuzzy sets – Tnorms and other aggregation operators – Basics of Approximate Reasoning – Compositional Rule of Inference – Fuzzy Rule Based Systems – Schemes of Fuzzification – Inferencing – Defuzzification – Fuzzy Clustering – fuzzy rule-based classifier.

UNIT III**18 Hours**

Neural Networks: What is Neural Network, Learning rules and various activation functions, Single layer Perceptions, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Recent Applications

UNIT IV**18 Hours**

Artificial Neural Networks: Fundamental Concepts – Basic Models of Artificial Neural Networks – Important Terminologies of ANNs – McCulloch-Pitts Neuron – Linear Separability – Hebb Network.

UNIT V**18 Hours**

Genetic Algorithm: Introduction – Biological Background – Genetic Algorithm Vs Traditional Algorithm – Basic Terminologies in Genetic Algorithm – Simple GA – General Genetic Algorithm – Operators in Genetic Algorithm.

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	S.N. Sivanandam and S.N. Deepa,	Principles of Soft Computing	Wiley India Pvt	2nd Edition
2.	Stuart Russell and Peter Norvig,	Artificial Intelligence - A Modern Approach	Pearson Education in Asia	2nd Edition,
3.	S. Rajasekaran, G. A. Vijayalakshmi,	Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications	PHI	2009
Reference Books				
1.	F. Martin, Mcneill, and Ellen Thro, 2000. Chin Teng Lin, C. S. George Lee	Fuzzy Logic: A Practical approach AP Professional	PHI	2011
2.	Chin Teng Lin, C. S. George Lee	Neuro-Fuzzy Systems	PHI	2018

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - I	BCA	Credits : 3
Course code: M23UCADSE4	CRYPTOGRAPHY	Contact Hours per week : 6

Objectives

- To understand the fundamentals of Cryptography.
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Analyze the vulnerabilities in any computing system and hence be able to design a security solution.	K1
CO2	Apply the different cryptographic operations of symmetric cryptographic algorithms	K4
CO3	Apply the different cryptographic operations of public key cryptography	K2
CO4	Illustrate the various Authentication schemes to simulate different applications.	K3
CO5	Understand various Security practices and System security standards.	K5

UNIT I

18 Hours

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

UNIT II

18 Hours

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

UNIT III

18 Hours

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

UNIT IV**18 Hours**

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

UNIT V**18 Hours**

Intruders–Malicious-software– Firewalls.

Text Book				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	William Stallings	Cryptography and Network Security Principles and Practices	Tata McGraw-Hill	2007
Reference Books				
1.	Behrouz A. Foruzan	Cryptography and Network Security	Tata McGraw-Hill	2007
2.	AtulKahate, TMH	Cryptography and Network Security	Tata McGraw-Hill	Second Edition, 2003
3.	M.V. Arun Kumar	Network Security	USP	First Edition 2011

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - II	BCA	Credits : 3
Course code: M23UCADSE5	ANALYTICS FOR SERVICE INDUSTRY	Contact Hours per week : 6

Objectives

- To recognize challenges in dealing with data sets in service industry.
- To identify and apply appropriate algorithms for analyzing the healthcare, human resource, hospitality and tourism data.
- To make choices for a model for new machine learning tasks.
- To identify employees with high attrition risk.
- To prioritizing various talent management initiatives for your organization.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand and critically apply the concepts and methods of business analytics.	K2
CO2	Identify, model and solve decision problems in different settings.	K1
CO3	Label appropriate courses of action for a given managerial situation whether a problem or an opportunity.	K2
CO4	Create viable solutions to decision making problems.	K4
CO5	Determine a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	K3

UNIT I**18 Hours**

Healthcare Analytics : Introduction to Healthcare Data Analytics- Electronic Health Records- Components of EHR- Coding Systems- Benefits of EHR- Barrier to Adopting HER Challenges-Phenotyping Algorithms. Biomedical Image Analysis and Signal Analysis- Genomic Data Analysis for Personalized Medicine. Review of Clinical Prediction Models.

UNIT II**18 Hours**

Healthcare Analytics Applications : Applications and Practical Systems for Healthcare- Data Analytics for Pervasive Health- Fraud Detection in Health care Data Analytics for Pharmaceutical Discoveries- Clinical Decision Support Systems Computer- Assisted Medical Image Analysis Systems- Mobile Imaging and Analytics for Biomedical Data.

UNIT III**18 Hours**

HR Analytics: Evolution of HR Analytics, HR information systems and data sources, HR Metric and HR Analytics, Evolution of HR Analytics; HR Metrics and HR Analytics; Intuition versus analytical thinking; HRMS/HRIS and data sources; Analytics frameworks like LAMP, HCM:21(r) Model.

UNIT IV**18 Hours**

Performance Analysis: Predicting employee performance, Training requirements, evaluating training and development, Optimizing selection and promotion decisions..

UNIT V**18 Hours**

Tourism and Hospitality Analytics: Guest Analytics – Loyalty Analytics – Customer Satisfaction – Dynamic Pricing – optimized disruption management – Fraud detection in payments.

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Chandan K. Reddy and Charu C Aggarwal,	Healthcare data analytics	Taylor & Francis	2015
2.	Edwards Martin R, Edwards Kirsten	Predictive HR Analytics: Mastering the HR Metric	Kogan Page Publishers ISBN-0749473924	2016
3.	Fitz-enzJac (2010)	The new HR analytics: predicting the economic value of your company's human capital investments	AMACOM, ISBN-13: 978-0-8144-1643-3	2010

Reference Books

1.	Hui Yang and Eva K. Lee	Healthcare Analytics: From Data to Knowledge to Healt	Wiley	2016
2.	Fitz-enzJac, Mattox II John	Predictive Analytics for Human Resources	Wiley, ISBN1118940709	2014

Mapping with Programme Specific Outcomes:

CO's/P SO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - II	BCA	Credits : 3
Course code: M23UCADSE6	ARTIFICIAL INTELLIGENCE	Contact Hours per week : 5

Objectives

- To learn various concepts of AI Techniques
- To learn various Search Algorithm in AI.
- To learn probabilistic reasoning and models in AI.
- To learn about Markov Decision Process.
- To learn various type of Reinforcement learning.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the various concepts of AI Techniques	K2
CO2	Apply various Search Algorithm in AI.	K3
CO3	Evaluate probabilistic reasoning and models in AI.	K4
CO4	Build Markov Decision Process.	K1
CO5	Categorize various type of Reinforcement learning Techniques.	K4

UNIT I

15 Hours

Introduction: 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

15 Hours

Search Algorithms: 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

15 Hours

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

UNIT IV

15 Hours

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

UNIT V**15 Hours**

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

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Stuart Russell and Peter Norvig	Artificial Intelligence: A Modern Approach	Prentice Hall	3rd Edition
2.	Elaine Rich and Kevin Knight	Artificial Intelligence	Tata McGraw Hill	2010

Reference Books

1.	Trivedi, M.C	Classical Approach to Artificial Intelligence	Khanna Publishing House	2010
2.	Saroj Kaushik	Artificial Intelligence	Cengage Learning India	2011
3.	David Poole and Alan Mack worth	Artificial Intelligence: Foundations for Computational Agents	Cambridge University Press	2010

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - II	BCA	Credits : 3
Course code: M23UCADSE7	ARTIFICIAL NEURAL NETWORKS	Contact Hours per week : 5

Objectives

- To understand the Error Correction and various learning algorithms and tasks.
- To identify the various Single Layer Perception Learning Algorithm.
- To identify the various Multi-Layer Perception Network.
- To analyze the Deep Learning of various Neural network and its Applications.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline the basics of artificial neural networks with single layer and multi-layer perception networks.	K1
CO2	Apply Error Correction and various learning algorithms and tasks	K2
CO3	Present Perception Learning Algorithm.	K3
CO4	Understand the various Multi-Layer Perception Network.	K2
CO5	Select Deep Learning of various Neural network and its Applications.	K4

UNIT I

15 Hours

Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Reparability, Nonlinear Separable Problem - Multilayer Networks. Learning Algorithms Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem

UNIT II

15 Hours

Introduction: Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit 12 assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.

UNIT III**15 Hours**

Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, learning in continuous perception. Limitation of Perception.

UNIT IV**15 Hours**

Multi-Layer Perception Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, Generalized delta learning rule, Back propagation algorithm.

UNIT V**15 Hours**

Deep learning- Introduction- Neuro architectures building blocks for the DL techniques, Deep Learning and Neocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN), feature extraction, Deep Belief Networks, Restricted Boltzman Machines, Training of DNN and Applications.

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Satish Kumar	Neural Networks A Classroom Approach	McGraw Hill	Second Edition
2.	Simon Haykins	Neural Network- A Comprehensive Foundation	Pearson Prentice Hall	2nd Edition, 1999

Reference Book

1.	B. Yegnanarayana,	Artificial Neural Networks	PHI, New Delhi	1998
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Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – V

DISCIPLINE SPECIFIC ELECTIVE - II	BCA	Credits : 3
Course code: M23UCADSE8	IMAGE PROCESSING	Contact Hours per week : 5

Objectives

- To learn fundamentals of digital image processing
- To learn about various 2D Image transformations.
- To learn about various image enhancement processing methods and filters
- To learn about various classification of Image segmentation techniques
- To learn about various image compression techniques

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts of digital image processing	K3
CO2	Discuss various 2D Image transformations	K2
CO3	Remember image enhancement processing techniques and filters.	K1
CO4	Explain the classification of Image segmentation techniques	K4
CO5	Use various image compression techniques	K3

UNIT I

15 Hours

Digital Image Fundamentals: Image representation - Basic relationship between pixels, Elements of DIP system -Applications of Digital Image Processing - 2D Systems - Classification of 2D Systems - Mathematical Morphology- Structuring Elements- Morphological Image Processing - 2D Convolution - 2D Convolution Through Graphical Method -2D Convolution Through Matrix Analysis.

UNIT II

15 Hours

2D Image transforms: Properties of 2D-DFT - Walsh transform - Hadamard transform- Haar transform- Discrete Cosine Transform Karhunen-Loeve Transform -Singular Value Decomposition.

UNIT III**15 Hours**

Image Enhancement: Spatial domain methods- Point processing Intensity transformations - Histogram processing- Spatial filtering smoothing filter- Sharpening filters - Frequency domain methods: low pass filtering, high pass Filtering- Homomorphism filter.

UNIT IV**15 Hours**

Image segmentation: Classification of Image segmentation techniques - Region approach - Clustering techniques - Segmentation based on thresholding - Edge based segmentation - Classification of edges- Edge detection - Hough transform- Active contour.

UNIT V**15 Hours**

Image Compression: Need for compression -Redundancy- Classification of image- Compression schemes- Huffman coding- Arithmetic coding Dictionary based compression -Transform based compression.

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	S Jayaraman, S Esakkirajan, T Veerakumar	Digital image processing	Tata McGraw Hill	2016
2.	Gonzalez Rafel C,	Digital Image Processing	Pearson Education	2009

Reference Books

1.	Jain Anil,	Fundamentals of digital image processing	PHI	1988
2.	Kenneth R Castleman	Digital image processing	Pearson Education	2003, 2nd Edition
3.	Pratt William K	Digital Image Processing	John Wiley	2007

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

Core Course : VII	BCA	Credits : 4
Course code: M23UCA07	COMPUTER NETWORKS	Contact Hours per week : 6

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basics of Computer Network architecture, OSI and TCP/IP reference model	K3
CO2	Recall knowledge on Telephone systems using wireless network	K1
CO3	Explain the concept of MAC.	K2
CO4	Analyze the characteristics of Routing and Congestion control algorithms	K4
CO5	Apply network security and define various protocols such as FTP, HTTP, Telnet, DNS	K3

UNIT I

18 Hours

Introduction –Network Hardware–Software–Reference Models–OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs – Physical Layer–Theoretical Basis for Data Communication–Guided Transmission Media.

UNIT II

18 Hours

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

UNIT III

18 Hours

Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem–Multiple Access Protocols–Bluetooth.

UNIT IV**18 Hours**

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

UNITV**18 Hours**

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

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	A.S.Tanenbaum	Computer Networks	Prentice - Hall of India	4th Edition 2008

Reference Books

1.	B.A.Forouzan	Data Communications and Networking	TataMcGrawHill	4th Edition 2017
2.	F. Halsall	Data Communications Computer Networks and Open Systems	Pearson Education	Pearson Education 2008
3.	D.Bertsekas and R.Gallagher	DataNetworks	PHI	2ndEdition,2008
4.	Lamarca	Communication Networks	Tata McGraw-Hill	2002

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

Core Course- VIII	BCA	Credits : 4
Course code: M23UCA08	DATA ANALYTICS USING R PROGRAMMING	Contact Hours per week : 5

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Remember to Work with big data tools and its analysis techniques	K1
CO2	Analyze data by utilizing clustering and classification algorithms.	K4
CO3	Apply different mining algorithms and recommendation systems for large volumes of data.	K3
CO4	Perform analytics on data streams	K3
CO5	Build NoSQL databases and management.	K6

UNIT I

15 Hours

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— Map Reduce and YARN— Map Reduce Programming Model

UNIT II

15 Hours

CONTROL STRUCTURES AND VECTORS- 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**15 Hours**

LISTS- Lists: 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 - Like Operations.

UNIT IV**15 Hours**

Factors and tables – 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 a Table - Math Functions - Calculating a Probability - Cumulative Sums and Products- Minima and Maxima – Calculus - Functions for Statistical Distributions RPROGRAMMING..

UNIT V**15 Hours**

OBJECT - ORIENTED PROGRAMMING S Classes- 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.

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Roger D.Peng	R Programming for Data Science	-	2012
2.	Norman Matloff	The Art of R Programming-A Tour of Statistical Software Design	-	2012

Reference Books

1.	Garrett Golemund, Hadley Wickham	HandsOn Programming with R: Write Your Own Functions and Simulations	-	1stEdition,2014
2.	Venables,W.N.,and Ripley.	S programming	Springer	2000

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

Core Practical – VI	BCA	Credits : 4
Course code: M23UCAP06	PRACTICAL - R PROGRAMMING LAB	Contact Hours per week : 5

Objectives

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

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge level
CO1	Remember to Work with big data tools and its analysis techniques	K3 & K4
CO2	Analyze data by utilizing clustering and classification algorithms.	
CO3	Apply different mining algorithms and recommendation systems for large volumes of data.	
CO4	Perform analytics on data streams	
CO5	Build NoSQL databases and management.	

List of Practical's:

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 from 1 to 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 c bind () and r bind () in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R (Vectors, Lists, and Data

Frames).

- 8.** Write a program to read a c s v file and analyze the data in the file in R.
- 9.** Create pie chart and bar chart using R.
- 10.** Create a data set and do statistical analysis on the data using R.
- 11.** Program to find factorial of the given n number using recursive function.
- 12.** Write a R program to count the n number of even and odd numbers from array of N numbers.

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - III	BCA	Credits : 3
Course code: M23UCADSE9	AGILE PROJECT MANAGEMENT	Contact Hours per week : 4

Objectives

- To learning of software design, software technologies and APIs.
- To detailed demonstration about Agile development and testing techniques.
- To learn about various Algorithms in Data Science.
- To learn about Hadoop Framework.
- To learn about case study about Data Science.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understanding of software design, software technologies and APIs using Agile Management.	K2
CO2	Give example of Agile development and testing techniques.	K2
CO3	Generate Agile Planning and Execution using Sprint.	K1
CO4	Analyze Agile Management Design, scope, Procurement, managing Time and Cost and Quality Check	K3
CO5	Classify Agile development and testing techniques.	K4

UNIT I

12 Hours

Introduction: Modernizing Project Management: Project Management Needed a Makeover – Introducing Agile Project Management. **Applying the Agile Manifesto and Principles:** Understanding the Agile manifesto – Outlining the four values of the Agile manifesto – Defining the 15 Agile Principles – Adding the Platinum Principles – Changes as a result of Agile Values – The Agile litmus test. **Why Being Agile Works Better:** Evaluating Agile benefits – How Agile approaches beat historical approaches – Why people like being Agile.

UNIT II

12 Hours

Being Agile: Agile Approaches: Diving under the umbrella of Agile approaches – **Reviewing the Big Three:** Lean, Scrum, And Extreme Programming - **Summary Agile Environments in Action:** Creating the physical environment – Low-tech communicating – High-tech communicating – Choosing tools. **Agile Behaviours in Action:** Establishing Agile roles – Establishing new values – Changing team philosophy

UNIT III

12 Hours

Agile Planning and Execution Defining the Product Vision and Roadmap: Agile planning – Defining the product vision – Creating a product roadmap – Completing the product backlog. **Planning Releases and Sprints:** Refining requirements and estimates – Release planning – Sprint planning. **Working throughout the Day:** Planning your day – Tracking progress – Agile roles in the sprint – Creating shippable functionality – The end of the day. **Showcasing Work, Inspecting and Adapting:** The sprint review – The sprint retrospective. **Preparing for Release:** Preparing the product for deployment (the release sprint) – Preparing the operational support – Preparing the organization for product deployment - Preparing the marketplace for product deployment.

UNIT IV

12 Hours

Agile Management Managing Scope and Procurement: What's different about Agile scope management – Managing Agile scope – What's different about Agile procurement – Managing Agile procurement. **Managing Time and Cost:** What's different about Agile time management – Managing Agile schedules – What's different about Agile cost management – Managing Agile budgets. **Managing Team Dynamics and Communication:** What's different about Agile team dynamics – Managing Agile team dynamics – What's different about Agile communication – Managing Agile communication. **Managing Quality and Risk:** What's different about Agile quality – Managing Agile quality – What's different about Agile risk management – Managing Agile risk.

UNIT V

12 Hours

Implementing Agile Building a Foundation: Organizational and individual commitment – Choosing the right pilot team members – Creating an environment that enables Agility – Support Agility initially and over time. **Being a Change Agent:** Becoming Agile requires change – why change doesn't happen on its own – Platinum Edge's Change Roadmap – Avoiding pitfalls – Signs your changes are slipping. **Benefits, Factors for Success and Metrics:** Ten key benefits of Agile project management – Ten key factors for project success – Ten metrics for Agile Organizations.

Text Book				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Mark C. Layton, Steven J. Ostermiller, ,	Agile Project Management for Dummies	Wiley India Pvt. Ltd.,	2nd Edition, 2018.
Reference Books				
1.	Mark C. Layton, David Morrow	Scrum for Dummies	Wiley India Pvt. Ltd.	2nd Edition 2018
2.	Mike Cohn, 2010.	Succeeding with Agile – Software Development using Scrum	Addison-Wesley Signature Series	2010
3.	Alex Moore	Agile Project Management	-	2020
4.	Alex Moore	Scrum	-	2020
5.	Andrew Stellman and Jennifer Greene, , Shroff/,.	Learning Agile: Understanding Scrum, XP, Lean, and Kanban	O'Reilly Media	First Edition, 2014

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - III	BCA	Credits : 3
Course code: M23UCADSE10	Big Data Analytics	Contact Hours per week : 4

Objectives

- To understand the Big Data Platform and its Use cases, Map Reduce Jobs.
- To identify and understand the basics of cluster and decision tree.
- To study about the Association Rules, Recommendation System.
- To learn about the concept of stream.
- To understand the concepts of NoSQL Databases.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Outline with big data tools and its analysis techniques	K1
CO2	Create data by utilizing clustering and classification algorithms.	K3
CO3	Use different mining algorithms and recommendation systems for large volumes of data.	K2
CO4	Perform analytics on data streams.	K3
CO5	Build NoSQL databases and management.	K4

UNIT I

12 Hours

Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — 12 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 — Map Reduce and YARN — Map Reduce Programming Model.

UNIT II

12 Hours

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 — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naive Bayes — Bayes Theorem — Naive Bayes Classifier.

UNIT III**12 Hours**

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.

UNIT IV**12 Hours**

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

UNIT V**12 Hours**

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 Ecommerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
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/Elsevier Publishers	2013
2.	EMC Education Services	Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data	Wiley publishers	2015

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - III	BCA	Credits : 3
Course code: M23UCADSE11	SOFTWARE PROJECT MANAGEMENT	Contact Hours per week : 4

Objectives

- To define and highlight importance of software project management.
- To formulate and define the software management metrics & strategy in managing projects.
- To familiarize in Software Project planning.
- To learn about Markov Decision Process.
- To understand to apply software testing techniques in commercial environment

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the principles and concepts of project management	K2
CO2	Develop knowledge gained to train software project managers	K1
CO3	Apply software project management methodologies.	K3
CO4	Support to create comprehensive project plans	K4
CO5	Evaluate and mitigate risks associated with software development process.	K5

UNIT I

12 Hours

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

12 Hours

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

12 Hours

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

UNIT IV**12 Hours**

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

UNIT V**12 Hours**

Quality: 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.

Text Book				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Robert T. Futrell, Donald F. Shafer, Linda I. Safer	Quality Software Project Management	Pearson Education Asia	2002
Reference Books				
1.	PankajJalote	Software Project Management in Practice	Addison Wesley	2002
2.	Hughes	Software Project Management	Tata McGraw Hill	2004, 3rd Edition

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER- VI

DISCIPLINE SPECIFIC ELECTIVE - III	BCA	Credits : 3
Course code: M23UCADSE12	Human Computer Interaction	Contact Hours per week : 4

Objectives

- To learn about the foundations of Human Computer Interaction..
- To learn the design and software process technologies.
- To learn HCI models and theories.
- To learn Mobile Ecosystem.
- To learn the various types of Web Interface Design.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamentals of HCI.	K2
CO2	Develop interactive design in HCI.	K1
CO3	Apply HCI models and theories.	K3
CO4	Relate Mobile Ecosystem, types of Mobile Applications, mobile Architecture and design.	K4
CO5	Determine the various types of Web Interface Design.	K3

UNIT I

12 Hours

FOUNDATIONS OF HCI: The Human: I/O channels – Memory Reasoning and problem solving; The Computer: Devices –Memory – processing and networks; **Interaction:** Models – frameworks – Ergonomics – styles –elements – interactivity- Paradigms. - Case Studies.

UNIT II

12 Hours

DESIGN & SOFTWARE PROCESS: Interactive Design: Basics – process – scenarios **Navigation:** screen design Iteration and prototyping. **HCI in software process:** Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT III

12 Hours

MODELS AND THEORIES: HCI Models: Cognitive models:- Socio-Organizational issues and stakeholder requirements Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV**12 Hours**

Mobile HCI: Mobile Ecosystem: Platforms, Application frameworks Types **of Mobile Applications:** Widgets, Applications, Games Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V**12 Hours**

WEB INTERFACE DESIGN: Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.

Text Books				
S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale,	Human -Computer Interaction	Edition, Pearson Education,	2004
2.	Brian Fling	Mobile Design and Development	O - Reilly Media Inc	I Edition, 2009
3.	Bill Scott and Theresa Neil,	Designing Web Interfaces	O_Reilly	First Edition 2009
Reference Book				
1.	Shneiderman	Designing the User Interface: Strategies for Effective Human-Computer Interaction	Pearson Education	V Edition

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - IV	BCA	Credits : 3
Course code: M23UCADSE13	Cloud Computing	Contact Hours per week : 4

Objectives

- To learning fundamental concepts and Technologies of Cloud Computing.
- To learning various cloud service types and their uses and pitfalls.
- To learn about Cloud Architecture and Application design.
- To know the various aspects of application design, benchmarking and security on the Cloud.
- To learn the various Case Studies in Cloud Computing.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental concepts and Technologies in Cloud Computing	K2
CO2	Develop various cloud service types and their uses and pitfalls	K6
CO3	Apply Cloud Architecture and Application design	K3
CO4	Justify the various aspects of application design, benchmarking and security in the Cloud	K4
CO5	Perform the Case Studies in Cloud Computing.	K3

UNIT I

12 Hours

Introduction to Cloud Computing: 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 – MapReduce – Identity and Access Management – Service Level Agreements – Billing.

UNIT II

12 Hours

Cloud Services Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - **Windows Azure Virtual Machines Storage Services:** Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure 12 SQL Database - **Windows Azure Table Service Application Services:** Application Runtimes and Frameworks - Queuing Services - Email Services – Notification Services - Media Services Content Delivery Services: Amazon

CloudFront - **Windows Azure Content Delivery Network Analytics Services:** Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - **Windows Azure HDInsight Deployment and Management Services:** Amazon Elastic Beanstack - Amazon Cloud Formation Identity and Access Management Services: Amazon Identity and Access Management - **Windows Azure Active Directory Open Source Private Cloud Software:** CloudStack – Eucalyptus – OpenStack.

UNIT III

12 Hours

Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Up gradation – 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

12 Hours

Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. **Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – **Data Security:** Securing data at rest, securing data in motion – Key Management – Auditing

UNIT V

12 Hours

Case Studies: Cloud Computing for Healthcare – Cloud Computing for 12 Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Arshdeep Bahga, Vijay Madiseti	Cloud Computing – A Hands On Approach	Universities Press (India) Pvt. Ltd	2018

Reference Books

1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter	Cloud Computing: A Practical Approach	Tata McGraw-Hill,	2013
2.	Barrie Sosinsky	Cloud Computing Bible	Wiley India Pvt. Ltd.,	2013
3.	David Crookes	Cloud Computing in Easy Steps	Tata McGraw Hill	2015
4.	Dr. Kumar Saurabh	Cloud Computing	Wiley India	Second Edition 2012

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - IV	BCA	Credits : 3
Course code: M23UCADSE14	IOT and its Applications	Contact Hours per week : 4

Objectives

- To use devices, gateways and data management in IoT.
- To design IoT applications in different domain and be able to analyze their performance.
- To implement basic IoT applications on embedded platform.
- To gain knowledge on Industry Internet of Things.
- To learn about the privacy and Security issues in IoT.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Give Example of big data tools and its analysis techniques	K2
CO2	Analyze data by utilizing clustering and classification algorithms.	K4
CO3	Apply different mining algorithms and recommendation systems for large volumes of data.	K1
CO4	Perform analytics on data streams.	K2
CO5	Choose NoSQL databases and management	K3

UNIT I

12 Hours

IoT& Web Technology, The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

UNIT II

12 Hours

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural 12 Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III**12 Hours**

IoT Architecture - State of the Art – Introduction, State of the art, Architecture. Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

UNIT IV**12 Hours**

IoT Applications for Value Creations: Introduction IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management.

UNIT V**12 Hours**

Internet of Things Privacy: Security and Governance Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities- First Steps Towards a Secure Platform- Smart Approach. Data Aggregation for the IoT in Smart Cities - Security.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Vijay Madiseti and ArshdeepBahga, – Universities Press (INDIA) Private Limited 2014,	Internet of Things: (A Hands-on Approach)	Universities Press (India) Pvt. Ltd	2014 1st Edition.

Reference Books

1.	Michael Miller	The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World	kindle version	2010
2.	Francis daCosta,	Internet of Things: A Scalable Approach to Connecting Everything	Apress Publications	1st Edition 2013
3.	Waltenegus Dargie, Christian Poellabauer	Fundamentals of Wireless Sensor Networks: Theory and Practice	Tata McGraw Hill	2008
4.	CunoPfister	Getting Started with the Internet of Things	O'Reilly Media	2011

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - IV	BCA	Credits : 3
Course code: M23UCADSE15	INFORMATION SECURITY	Contact Hours per week : 4

Objectives

- To know the objectives of information security.
- To understand the importance and application of each of confidentiality integrity, authentication and availability.
- To understand various cryptographic algorithms.
- To understand the basic categories of threats to computers and networks.
- To study about the concepts of security in networks, web security.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand network security threats, security services, and counter measures	K2
CO2	Classify vulnerability analysis of network security.	K4
CO3	Apply background on hash functions; authentication; firewalls; intrusion detection techniques.	K3
CO4	Develop hands on experience with programming and simulation techniques for security protocols	K1
CO5	Apply methods for authentication, access control, intrusion detection and prevention	K3

UNIT I

12 Hours

Introduction to Information Security: Security mindset, Computer Security Concepts (CIA), Attacks, Vulnerabilities and protections, Security Goals, Security Services, Threats, Attacks, Assets, malware, program analysis and mechanisms.

UNIT II

12 Hours

The Security Problem in Computing: The meaning of computer Security, Computer Criminals, Methods of Defence. **Cryptography:** Concepts and Techniques: Introduction, plain text and cipher Text, substitution techniques, transposition techniques, encryption and decryption.

UNIT III**12 Hours**

Symmetric and Asymmetric Cryptographic Techniques: DES - AES ,RSA algorithms .**Authentication and Digital Signatures** :Use of Cryptography for authentication, Secure Hash function, Key management–Kerberos.

UNIT IV**12 Hours**

Program Security: Non-malicious Program errors – Buffer over flow, In complete mediation, Time-of-check to Time-of- use Errors, Viruses, Trap doors, Salami attack, Man-in-the- middle attacks, Covert channels. File protection Mechanisms, User Authentication Designing Trusted O.S: Security polices models of security, trusted O.S design, Assurance in trusted O.S. Implementation examples.

UNIT V**12 Hours**

Security in Networks: Threats in networks, Network Security Controls–Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honey pots, Traffic flow security. **Web Security:** Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction.

Text Books

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Charles P. Pfleeger	Security in Computing	Pearson Education	Fourth Edition.
2.	William Stallings,	Cryptography And Network Security Principles And Practice	Pearson	Fifth Edition

Reference Books

1.	CK Shyamala, NHarini, DrTR Padmanabhan,	Cryptography and Network Security	Wiley India,	Lst Edition
2.	Cryptography and Network Security: Frozen Mukhopadhyay	Cryptography and Network Security	McGraw Hill	2"dEdition
3.	Mark Stamp	Information Security, Principles and Practice	Wiley India	2010
4.	WM .Arthur Conklin, Greg White,	Principles of Computer Security	TMH	2014

Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO 1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium

SEMESTER – VI

DISCIPLINE SPECIFIC ELECTIVE - IV	BCA	Credits : 3
Course code: M23UCADSE16	GRID COMPUTING	Contact Hours per week : 4

Objectives

- To learn the basic construction and application of Grid computing.
- To learn grid computing organization and their Role..
- To learn Grid Computing Anatomy.
- To learn Grid Computing road map
- To learn various type of Grid Architecture.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic elements and concepts of Grid computing	K2
CO2	Identify the Grid computing tool kits and Framework.	K3
CO3	Outline the concepts of Anatomy of Grid Computing..	K1
CO4	Choose the concept of service oriented architecture	K4
CO5	Modify the knowledge on grid and web service architecture.	K2

UNIT I

12 Hours

Introduction: Early Grid Activity, Current Grid Activity, Overview of Grid Business areas, Grid Applications, Grid Infrastructures..

UNIT II

12 Hours

Grid Computing organization and their Roles: Organizations Developing Grid Standards, and Best Practice Guidelines, Global Grid Forum (GCF), #Organization Developing Grid Computing Toolkits and Framework #, Organization and building and using grid based solutions to solve computing, commercial organization building and Grid Based solutions.

UNIT III

12 Hours

Grid Computing Anatomy: The Grid Problem, The conceptual of virtual organizations, # Grid Architecture # and relationship to other distributed technology.

UNIT IV

12 Hours

The Grid Computing Road Map: Autonomic computing, Business on demand and infrastructure virtualization, Service-Oriented Architecture and Grid, # Semantic Grids#.

UNIT V**12 Hours****Merging the Grid services Architecture with the Web Services**

Architecture: Service-Oriented Architecture, Web Service Architecture, # XML messages and Enveloping #, Service message description Mechanisms, Relationship between Web Services and Grid Services, Web services Interoperability and the role of the WS-I Organization.

Text Book

S.No	Author	Title of the Book	Publisher	Year of Publications
1.	Joshy Joseph and Craig Fellenstein,.	Grid computing	Pearson/IBMPress	2004

Reference Book

1.	Ahmer Abbas and Graig computing	A Practical Guide to technology and applications	Charles River Media	2003
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Mapping with Programme Specific Outcomes:

CO's/ PSO's	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	M	M	S	S
CO2	S	S	M	S	M
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	M	S	S	S

S-Strong M-Medium