

B.Sc.,
COMPUTERSCIENCE

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

SYLLABUS

ACADEMIC YEAR 2024-2025 ONWARDS

**TAMILNADU STATE COUNCIL FOR HIGHER
EDUCATION, CHENNAI-600005**

1. Introduction

B.Sc. Computer Science

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) which makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence, Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific

challenges. Computer Science is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

Programme Outcome, Programme Specific Outcome and Course Outcome

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The

Students completing this programme will be able to present Software application clearly and precisely, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

2. Programme Outcomes (PO) of B.Sc. degree programme in Computer Science

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.

- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefiting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design /Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

3. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

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

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

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

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

4. Highlights of the Revamped Curriculum

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
- The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Computer Science based problem solving skills are included as mandatory components in the „Training for Competitive Examinations“ course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.

- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest – Statistics with R Programming, Data Science, Machine learning. Internet of Things and Artificial Intelligence etc..

5. Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/Benefits
I	<p>Foundation Course</p> <p>To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical Concepts to real world.</p>	<ul style="list-style-type: none"> ● Instil confidence among students ● Create interest for the subject
I,II,III, IV	<p>Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)</p>	<ul style="list-style-type: none"> ● Industry ready graduates ● Skilled human resource ● Students are equipped with essential skills to make them employable ● Training on Computing/Computational skills Enable the students gain knowledge and exposure on latest computational aspects ● Data analytical skills will enable students gain internships, apprenticeships, field work involving Data collection, compilation, analysis etc. ● Entrepreneurial skill training will provide an opportunity for independent livelihood ● Generates self- employment ● Create small scale entrepreneurs ● Training to girls leads to women empowerment ● Discipline centric skill will improve the Technical know how of solving real life problems using ICT Tools
III,IV,V &VI	<p>Elective papers- An open choice of topics categorized under Generic and Discipline Centric</p>	<ul style="list-style-type: none"> ● Strengthening the domain knowledge ● Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature ● Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background ● Emerging to pics in higher education/industry/

		communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	<ul style="list-style-type: none"> ● Exposure to industry moulds students into solution providers ● Generates Industry ready graduates ● Employment opportunities enhanced
II year Vacation activity	Internship /Industrial Training	<ul style="list-style-type: none"> ● Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional Experience and also become responsible citizens.
V Semester	Project with Viva- voce	<ul style="list-style-type: none"> ● Self-learning is enhanced ● Application of the concept to real situation is conceived resulting intangible outcome
VI Semester	Introduction of Professional Competency component	<ul style="list-style-type: none"> ● Curriculum design accommodates all category of learners; „Mathematics for Advanced Explain“ component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; ● „Training for Competitive Examinations“–caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: For Advanced Learners/Honors degree		<ul style="list-style-type: none"> ● To cater to the needs of peer learners/research aspirants

B.Sc. Computer Science Curriculum Design

(From the academic year 2024-2025 to 2026-2027)

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language–Tamil	3	6
Part-II	English	3	6
Part-III	CC 1-PythonProgramming	5	5
	CC2-Practical- Python Programming	3	5
	Elective Course(EC-1) (Generic /Discipline Specific) – Digital Logic Fundamental	3	4
Part-IV	Skill EnhancementCourse-SEC-1 Practical-Office Automation	2	2
	Foundation Course FC – Problem Solving Techniques	2	2
		21	30

Semester-II

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	Language-Tamil	3	6
Part-II	English	3	4
Part-III	CC3-Data Structure and Algorithms	5	5
	CC4-Practical - Data Structure and Algorithms	3	5
	Elective Course(EC2) (Generic /Discipline Specific) – Discrete Mathematics	3	4
Part-IV	SkillEnhancementCourse-SEC-2 Practical -HTML	2	2
	Skill EnhancementCourse–SEC-3 (Discipline Specific / Generic) Computer Architecture	2	2
	Naan Muthalvan Course –English/Soft skills for Employability	2	2
		23	30

Semester-III

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	CC 5 -Programming in C++	4	4
	CC6 - Practical-Programming in c++	3	5
	Elective Course(EC 3) (Generic / Discipline Specific) - EC3 – Choose any one – IOT and it's applications/Introduction to data science/ Micro Processor and Micro Controller	3	3
Part-IV	Skill Enhancement Course -SEC-4 (Entrepreneurial Based) – Practical -PHP Programming	2	2
	Skill Enhancement Course -SEC-5 Naan Muthalvan /HTML	2	2
	Environmental Studies	2	2
		22	30

Semester-IV

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	CC7 - Java Programming	4	4
	CC8 - Practical- Java Programming	3	5
	Elective Course (EC4) (Generic / Discipline Specific) Choose any one – Resource Management Techniques/ Analytics for Service Industry/Biometrics	3	3
Part-IV	Skill Enhancement Course – SEC-6 - Practical - Advanced Excel	2	2
	Skill Enhancement Course - SEC-7 – Naan Muthalvan /Internet fundamentals	2	2
	Value Education	2	2
		22	30

Semester-V

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	CC9 - Software Engineering	4	5
	CC10 - Database Management System	4	5
	CC11 - Image Processing	4	4
	CC12 - Practical: Image Processing Lab	4	5
	Elective Course – EC5 (Generic / Discipline Specific) – Choose any one -Cloud Computing /Data Analytics using R/ Natural Language Processing	3	4
	CC13 - Mini Project with viva voce- Case Studies related to DBMS	4	5
Part-IV	Naan Muthalvan / Office Automation	2	2
	Internship / Industrial Training / field visit/knowledge updation activities	2	-
		27	30

Semester-VI

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-III	CC14 - Computer Networks	4	5
	CC15 - .NET Programming	4	5
	CC16 - Operating System	4	4
	CC17 - Practical: .NET Programming Lab(ASP.NET)	4	5
	Elective Course (EC6) (Generic / Discipline Specific) – Choose any one – Artificial Intelligence/ Artificial Neural Network/Cyber Forensics	3	4
	CC18 - Core /Major Project with Viva voce	4	5
Part-IV	Professional Competency Skill Enhancement Course SEC8 /Naan Muthalvan / Programming in C	2	2
Part -V	Extension Activity NSS/NCC/YRC/RRC/SPORTS/OUTREACH PROGRAM	2	
		27	30

Students those who not attended the Naan Muthalvan course or failed, must do the course(Self learning) Soft skills for Employability, HTML, Internet fundamentals, Office automation and C Programming in Semester II, III, IV, V, and

VI respectively.

SEMESTER I

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC1	Python programming	Core	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	To make students understand the concepts of Python programming.									
LO2	To apply the OOPs concept in PYTHON programming.									
LO3	To impart knowledge on demand and supply concepts									
LO4	To make the students learn best practices in PYTHON programming									
LO5	To know the costs and profit maximization									
UNIT	Contents									No.of Hours
I	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.									15
II	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.									15
III	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.									15

IV	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 Function And Methods- Difference between Lists and Dictionaries.	15
----	---	----

V	Python File Handling: Types of files in Python - Opening and Closing files- Reading and Writing files: write() and writelines() methods- append() method– read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	15
---	--	----

TOTAL HOURS		75
--------------------	--	-----------

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, Tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6

Textbooks	
1	Reema Thareja, “Python Programming using problem solving approach ”, First Edition, 2017, Oxford University Press.
2	Dr.R.Nageswara Rao, “Core Python Programming”, First Edition, 2017, Dreamtech Publishers.

Reference Books	
1.	Vamsi Kurama, “Python Programming: A Modern Approach”, Pearson Education.
2.	Mark Lutz, “Learning Python”, Orielly.
3.	Adam Stewarts, “Python Programming”, Online.

4.	FabioNelli, “Python Data Analytics”, APress.
5.	Kenneth A.Lambert, “Fundamentals of Python–First Programs”, CENGAGE Publication.
Web Resources	

1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC2	Practical - Python Programming	Core	-	-	5	-	3	50	50	100
Learning Objectives										
LO1	Be able to design and program Python applications.									
LO2	Be able to create loops and decision statements in Python.									
LO3	Be able to work with functions and pass arguments in Python.									
LO4	Be able to build and package Python modules for reusability.									
LO5	Be able to read and write files in Python.									
S.No	List of Exercises								Hours	

	<ol style="list-style-type: none"> 1. Write a Python program to read and print values of variables of different data types 2. Write a Python program to perform addition, subtraction, multiplication, division, integer division and modulo division on two integer numbers.. 3. Write a Python program to determine whether the character entered is a vowel or not using conditional statement 4. Write a Python program to calculate the factorial of a number using loop. 5. Write a Python program to calculate the square root of a number. Use break, continue and pass statements. 6. Write a Python program using function and return statement to check whether a number is even or odd. 7. Write a Python program to print the Fibonacci series using recursion 8. Write a Python program to reverse the order of the items in the array. 9. Write a Python program that accepts a string from the user and redisplay the same string after removing vowels from it. 10. Write a Python program to remove all duplicates from a list. 11. Write a Python program that has a list of numbers.(both positive and negative). Make new tuple that has only positive values from this list. 12. Write a Python program that creates a dictionary of radius of a circle and its circumference 	
--	---	--

Course Outcomes	
On completion of this course, students will	
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language
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.

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightageofcourse contributed to each PSO	15	15	13	15	13	14

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

MMSU

Subject code	Subject Name	Category	L	T	P	S		I	M		
									s	A	Ext
									t.	ern	l
									H	al	
									o		
									u		
									r		
									s		
EC-1	Digital Logic Fundamentals	Elective course-2	4	-	-	-	3	4	25	75	100
Learning Objectives											
LO1	To understand the concepts of number systems										
LO2	To learn conversions										
LO3	To construct truth tables										
LO4	To learn SOP and POS										
LO5	To understand various simplifications										
UNIT	Contents										No. of Hours
I	<p>Number Systems :Codes and Digital Logic Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion –Octal Numbers –Hexadecimal Numbers –The ASCII Code –The Excess- 3 Code –The Gray Code. Digital Logic: The Basic gates NOT,OR,AND– Universal Logic Gates NOR,NAND– AND-OR Invert Gates.</p>										15
II	<p>Combinational Logic: Circuits Boolean Laws and Theorems – Sum of Products Method–Truth Table to Karnaugh Map –Pairs, Quads and Octets –Karnaugh Simplifications –Don't Care Conditions –Product of Sums Method –Product of Sums Simplification.</p>										15

III	Data Processing and Arithmetic circuits : Multiplexers – De-multiplexers – 1-of-16-Decoders – BCD- to-Decimal Decoders – Seven-Segment decoders – Encoders – Exclusive-OR gates. Arithmetic Circuits: Binary Addition – Binary Subtraction – Unsigned Binary Numbers – Sign-Magnitude Numbers – 2’s Complement Representation – 2’s Complement Arithmetic.	15
-----	---	----

IV	Flip-Flops: RS Flip Flops – Edge Triggered RS Flip Flops – Edge Triggered D Flip Flops – Edge Triggered JK Flip Flops – JK Master Slave Flip Flops	15
V	Registers : Types of Registers – Serial in serial out – serial in parallel out – parallel in serial out – parallel in parallel out – Universal Shift Register.	15
Total		75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of various number systems	PO1,PO6
CO2	Understand basic concepts of digital systems	PO2
CO3	Describe the storage structures	PO2,PO4
CO4	Solve problems using SOP and PoS	PO4,PO6
CO5	Apply concepts for simplifications	PO5,PO6

Text Book

TextBook:

Digital Principles and Applications, by Albert Paul Malvino & Donald P. Leach, Seventh Edition, McGraw Hill Education Private Limited

Reference Books:

1. Fundamentals of Digital Circuits, A. Anand Kumar, Second Edition, PHI Learning Private Limited
2. Digital design, M. Morris Mano, Third Edition, Pearson Education

Course code and title: Digital Logic Fundamentals Mapping with Programme Outcomes:

CO/PO	PSO					%of co's
	1	2	3	4	5	
C01	3	3	2	2	2	2.5
C02	3	3	3	3	2	2.7
C03	2	3	3	3	2	2.5
C04	2	2	3	3	3	2.6
C05	2	2	3	3	3	2.7
Average of CO's=2.6(high)						

Title of the Course/ Paper	Subject Name	Category	L	T	P	S		I n s t. H o u r s	M a r k s		
									CI A	Ext ernal	Tota l
SEC1	Practical-Office Automation	Core	-	-	2	-	2	2	50	50	100
Learning Objectives											
LO1	To understand the concepts of MS word										
LO2	To learn the features of Word										
LO3	To do calculations in excel										
LO4	To Design invitation set using Word										
LO5	To understand and design presentations										
Sl. No	Contents									No. of hours	

.1	Usage of Numbering, Bullets, Indents and Headers in a Word Document	
2	Prepare a Calendar in a Word Document	
3	Usage of Spell Check, Find and Replace	
4	Picture Insertion and Alignment	
5	Prepare a semester wise mark statement for a computer class of 20 students using any spreadsheet worksheet. Total, average and rank the student marks. Give proper headings. Make the column headings bold and italics	
6	Use any spreadsheet to use mathematical, statistical and logical functions	
7	Use any spreadsheet to plot a chart for marks obtained by the students(outof5)vs. frequency (total number of students in class is 50).	
8	Create a student database and create validation rules for fields like age, date of birth, pincode etc.	
9	Enter data to the student database using a form.	

10	Create a query and add criteria to the query.	
	Total	

Reference Books:

1. Microsoft Office 2016 Step By Step, Lambert, Joan, Frye, Curtis D. ,Phi Learning
2. Microsoft Access 2016 Step By Step, By Lambert, Joan Phi Learning
3. Microsoft Excel 2016 Step By Step, Curtis Frye, Phi Learning
4. Browse the Internet for Open Source Office Software

MSSU

Subject Code	Subject Name	Category	L	T	P	S		Inst. Hours	Marks		
									CI A	Ext ernal	Tot al
FC	Problem Solving Techniques	FC	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.										
LO2	Implement different programming constructs and decomposition of problems in to functions.										
LO3	Use dataflow diagram, Pseudocode to implement solutions.										
LO4	Define and use of arrays with simple applications										
LO5	Understand about operating system and their uses										
UNIT	Contents								No. Of.Hours		
I	Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software.								6		

II	Programming Languages: Machine language, Assembly language, High-level language, 4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers. Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).	6
----	---	---

III	Structured Programming: Algorithm: Features of good algorithm, Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.	6
IV	Pseudocode: Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. Selection Structures: Relational and Logical Operators -Selecting from Several Alternatives – Applications of Selection Structures.	6
V	Repetition Structures: Counter Controlled Loops –Nested Loops– Applications of Repetition Structures. Data: Numeric Data and Character Based Data. Arrays: One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	6
		30

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1,PO2,PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flowchart and pseudocode.	PO1,PO2,PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1,PO2,PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1,PO2,PO3, PO4, PO5, PO6

Textbooks	
1	Stewart Venit , “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers.
WebResources	
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067
3.	http://utubersity.com/?page_id=876

MappingwithProgrammeOutcomes:

MSSU

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	2	3	3	3	3
CO 4	3	3	2	3	3	3
CO 5	3	3	3	3	3	2
Weightage of course contributed to each PSO	15	14	14	15	15	14

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

MRS

Semester II

Title of the Course/ Paper	Subject Name	Category	L	T	P	S		I n s t. H o u r s	M a r k s		
									CI A	Ext ern al	Tota l
CC3	DATA STRUCTUREAND ALGORITHMS	Core	5	-	-	-	5	5	25	75	100
Learning Objectives											
LO1	To understand the concepts of ADTs										
LO2	To learn linear data structures-lists, stacks, queues										
LO3	To learn Tree structures and application of trees										
LO4	To learn graph structures and application 0[of graphs										
LO5	To understand various sorting and searching										
UNIT	Contents									No. of Hours	
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linkedlists-applicationsoflists-PolynomialManipulation-All operations-Insertion-Deletion-Merge-Traversal									15	
II	Stack ADT-Operations-Applications-Evaluating arithmetic expressions-Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue-Priority Queue-deQueue applications of queues.									15	

III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT-Threaded Binary Trees-Heap-Applications of heap.	15
IV	Definition-Representation of Graph-Types of graph-Breadth first traversal-Depthfirsttraversal-Topologicalsort-Bi-connectivity-Cut vertex-Euler circuits-Applications of graphs.	15
V	Searching-Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort--Hashing-Hash functions-Separate chaining- Open Addressing-	15
Total		75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and Its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Book		
1	1.MarkAllenWeiss,“Data Structures and Algorithm Analysisin C++”,Pearson Education2014,4thEdition.	
2	ReemaThareja,“Data Structures Using C”,OxfordUniversitiesPress2014,2nd Edition	
Reference Books		
1.	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,“Introduction To Algorithms”, McGraw Hill2009,3rdEdition.	
2.	Aho, Hopcroft andUllman,“DataStructuresandAlgorithms”,PearsonEducation2003	
3.	Ellis Horowitz, Satraj Sahni “Fundamentals of Computer Algorithms”, Universities Press; Second edition (1 January 2008)	
4.	Debasis Samanta, “Classic Data Structures”, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2009)	
5.	Richard F. Gilberg ,”Data Structures: A Pseudocode Approach using C++”, CENGAGE LEARNING (1 January 2006)	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course Contributed to each PSO	15	14	13	13	15	14

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

Title of the Course/Paper	Subject Name	Category	L	T	P	S		I	M a r k s			
									n	C I	Ext	Tota
									s	A	ernal	l
									t.			
									H			
									o			
									u			
									r			
									s			
CC4	Practical-DATA STRUCTURE AND ALGORITHMS [Note: Practicals may be offered through C /C++/ Python]	Core	-	-	5	-	3	-	50	50	100	
Learning Objectives												
LO1	To understand the concepts of ADTs											
LO2	To learn linear data structures -lists,stacks,queues											
LO3	To learn Tree structures and application of trees											
LO4	To learn graph structures and application of graphs											
LO5	To understand various sorting and searching											
Sl. No	Contents										No. of Hours	
1	Search an element in a list using Binary Search.											
2	Implementation of Stack- Push and Pop.											
3	Implementation of Queue– Enqueue and Dequeue											

4	Implementation of Binary Tree Traversals using recursion. a) Pre-order b)In-order c)Post-Order	
5	Implementation of Breadth First Search algorithm.	
6	Implementation of Depth First Search algorithm.	
7	Implementation of Merge Sort	
8	Implementation of Quick Sort	
	Total	60

MSSU

		Programme Outcome
CO		
1		PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and Its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
Text Book		
1	Mark Allen Weiss,“Data Structures and Algorithm Analysis in C++”, Pearson Education2014,4thEdition.	
2	ReemaThareja,“DataStructuresUsingC”,OxfordUniversitiesPress2014,2nd Edition	
Reference Books		
1	ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,“Introduction to Algorithms”, McGraw Hill2009,3rdEdition	
2.	Aho, Hopcroft andUllman,“DataStructuresandAlgorithms”,PearsonEducation2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

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

Course Code-Elective Course EC2	Discrete Mathematics		Credits 3
Lecture Hours:(L) perweek-4	TutorialHours:75 (T)per week	Hours: (P)per week	Total:(L+T+P) perweek:4
Course Category: Elective	Year &Semester: I Year II Semester	Admission Year:	
Pre-requisite	Basic Knowledge of Programming concept		
<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1:Know how to solve various problems on discrete mathematics</p> <p>CO2:Use approximation to solve problems</p> <p>CO3:Differentiationandintegrationconceptare applied</p> <p>CO4:Apply, direct methods for solving linear systems</p> <p>CO5:Discretresolution of ordinary problems</p>			
Units	Contents		Required Hours
I	Set theory-Sets and elements-Specifications of sets-Identity and Cardinality-Set inclusion-Equality of sets-proper sets-Power sets-Universal set-Operations on sets-ordered pairs-Cartesian product of sets		15
II	Relations and functions-Definition-example-Relations on sets- Equivalence relations-Equivalence Class - Functions		15
III	MATHEMATICAL LOGIC Introduction – Statement (Propositions) – Laws of Formal Logic – Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence –Logical Implication – Normal Forms		15

IV	MATRIX ALGEBRA Introduction–Definition of a Matrix-Types of Matrices–Operations on Matrices–Related Matrices– Transpose of a Matrix –Symmetric and Skew-symmetric Matrices –Complex Matrix–Conjugate of a Matrix–Determinant of a Matrix– Typical Square Matrices	15
V	Adjoint and Inverse of a Matrix –Singular and Non-singular Matrices–Adjoint of a Square Matrix –Properties of Adjoin to a Matrix–Properties of Inverse of a Matrix.	15

Textbook:

Discrete Mathematics, Swapan Kumar, Chakraborty and Bikash Kanti Sarkar, OXFORD University Press.

Referencebooks:

1. Discrete Mathematics, Third Edition, Seymour Lipschutz And Marc Lars Lipson, Tata Mcgraw Hill Education Private Limited.
2. Discrete Mathematical Structures With Applications To Computer Science By J.P.Tremblay, R.Manohar TMH Edition

Title of the Course/ Paper	Subject Name	Category	L	T	P	S		I n s t. H o u r s	M a r k s		
									CI A	Ext ern al	Tota l
SEC2	Practical- HTML	Skill Enhancement Course	-	-	2	-	2	2	50	50	100
LO1	To understand the concepts of links										
LO2	To learn tags, lists										
LO3	To learn frames and its applications										
LO4	To apply forms and to create pages										
LO5	To apply sound effect										
Sl. No	Contents										No. of Hours
1	Create a website using internal links and images.										
2	Design a calendar using table tag.										
3	Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible.										
4	Write an HTML code to display a list of 5 cars in a frame, Link each one to a brief Description in second frame. The left frame Should display the list and the right frame should display the paragraph about the frame.										
5	Create a simple HTML Form covering major form elements.										
6	Embed Audio and Video in an HTML page										
7	Rotate an element using CSS.										

8	Build a simple quiz	
---	---------------------	--

--	--	--

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	I n s t. H o u r s	M a r k s			
								CI A	Ext ern al	Tota l	
SEC-3	Computer Architecture	Skill Enhancement	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	To understand Basic computer organization										
LO2	To learn about CPU										
LO3	To learn Computer arithmetic										
LO4	To understand interface										
LO5	To learn various types of memory										
UNIT	Contents									No. of Hours	

I	Basic Computer Organization and Design: Instruction Codes- Computer Registers- Computer Instructions- Instruction cycle-Control memory.	6
II	Central Processing Unit: General register organization- Stack organization- Instruction formats- Addressing modes- Data transfer and manipulation.	6
III	Computer Arithmetic: Hardware implementation and algorithm for addition, subtraction, Multiplication, Division.	6
IV	Arithmetic and Interface: Booth multiplication algorithm- Floating point arithmetic- Input-output interface- Direct Memory Access.	6
V	Memory Organisation: Memory Hierarchy- Main memory- Auxillary Memory- Associative Memory- Cache Memory.	6

Text Book:

Computer System Architecture- Morris Mano, Third Edition, PHI Private Ltd.

Reference Books:

1. Computer System Architecture - John P.Hayes
2. Computer Organization- C.Hamacher, Z. Vranesic, S.Zaky
3. Computer Architecture and Parallel Processing- Hwang K

SECOND YEAR SEMESTER III

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC5	PROGRAMMING in C++	Core	4	-	-	-	4	4	25	75	100
Learning Objective											
LO1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects										
LO2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc										
LO3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism										
LO4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming										
LO5	Demonstrate the use of various OOPs concepts with the help of programs										

UNIT	Contents	No. of Hours
I	Introduction to C++ - key concepts of Object-Oriented Programming – Advantages – ObjectOriented Languages – I/O in C++ - C++ Declarations. Control Structures : - Decision Makingand Statements : If ..else, jump, goto, break, continue, Switch case statements - Loops in C++ :for, while, do - functions in C++ - inline functions – Function Overloading.	15
II	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.	15
III	Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchal,Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.	15
IV	Pointers – Declaration – Pointer to Class , Object – this pointer – Pointers to derived classes andBase classes – Arrays – Characteristics – array of classes – Memory models – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.	15
V	Files – File stream classes – file modes – Sequential Read / Write operations – Binary and ASCIIFiles – Random Access Operation – Templates – Exception Handling - String – Declaring andInitializing string objects – String Attributes – Miscellaneous functions.	15
Total		75
Course Outcomes		Programme Outcome
CO	Upon completion of the course the students would be able to:	
1	Remember the program structure of C with its syntax and semantics	PO1,PO6
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2
3	Apply the programming principles learnt in real-time problems	PO4 ,PO5
4	Analyze the various methods of solving a problem and choose the best method	PO6
5	Code, debug and test the programs with appropriate test cases	PO3,PO6
Text Book		
1	E. Balagurusamy, “Object-Oriented Programming with C++”, TMH 2013, 7th Edition.	
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.	
Web Resources		
1.	https://alison.com/course/introduction-to-c-plus-plus-programming	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	2	3	3
CO 3	3	2	2	2	3	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	2	3	3
Weight age of course contributed to each PSO	15	13	14	12	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	In-st. Hours	Marks		
									CIA	External	Total
CC6	Practical-PROGRAMMING in C++	Core	-	-	5	-	3		50	50	100
Course Objective											
C1	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects										
C2	Understand dynamic memory management techniques using pointers, constructors, destructors, etc										
C3	Describe the concept of function overloading, operator overloading, virtual functions and polymorphism										
C4	Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming										
C5	Demonstrate the use of various OOPs concepts with the help of programs										
S.No	List of Exercises									No. of Hours	
1	Write a C++ program to demonstrate Class and Objects .										
2	Write a C++ program to demonstrate function overloading										
3	Write a C++ program to demonstrate the concept of Passing Objects to Functions										

4	Write a C++ program to demonstrate the Friend Functions.	60	
5	Write a C++ program to demonstrate Constructor and Destructor		
6	Write a C++ program to demonstrate Unary Operator Overloading		
7	Write a C++ program to demonstrate Binary Operator Overloading		
8	Write a C++ program to demonstrate: Single Inheritance		
9	Write a C++ program to demonstrate: Multiple Inheritance		
10	Write a C++ program to demonstrate Virtual Functions.		
11	Write a C++ program to find the Biggest Number using Command Line Arguments		
12	Write a C++ program to demonstrate Exception Handling.		
13.	Write a C++ program to traverse an array using pointers		
14.	Write a C++ program to create a text file and write some content into it		
15	Write a ++ program to open an existing text file and display its contents		
Course Outcomes			Programme Outcome
CO	Upon completion of the course the students would be able to:		
1	Remember the program structure of C with its syntax and semantics		PO4,PO5
2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO6	
3	Apply the programming principles learnt in real-time problems	PO4 ,PO5	
4	Analyze the various methods of solving a problem and choose the best method	PO6	
5	Code, debug and test the programs with appropriate test cases	PO4,PO5	
Text Book			
1	E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.		
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.		
Web Resources			
1.	https://alison.com/course/introduction-to-c-plus-plus-programming		

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
--------	-------	-------	-------	-------	-------	-------

CO 1	3	3	3	3	3	3
CO 2	3	2	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	2	3	3	3
CO 5	3	2	3	3	3	2
Weightage of course contributed to each PSO	15	12	14	15	14	14

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

Elective Course 3 - EC3- Choose any one - IOT and it's Applications/ Introduction to Data Science/Microprocessor and Micro Controller

Subject Code	Subject Name	Category	L	T	P	S
EC3	IOT and it's applications	Elective	3	-	-	-
Course Objective						
C1	To understand the concept of IOT and layers					
C2	Design IoT applications in different domain and be able to analyze their performance					
C3	To learn M2M					
C4	To gain knowledge on IOT implementation using Python					
C5	To Learn about IoT physical devices					
UNIT	Contents					
I	Introduction: Definition & Characteristics of IOT - Physical Design of IOT: Things in IOT - IOT protocols: Link layer - Network/Internet layer - Transport layer - Application layer - Logical design of IOT: IOT functional blocks- IOT communication Models - IOT enabling technologies: Wireless Sensor Networks - Cloud computing - Big data analytics- Communication Protocols - Embedded systems.					

II	IOT Applications: Introduction - Home automation: Smart lighting - Smart appliances - Intrusion Detection - Smoke/Gas Detectors- Cities: Smart parking- Smart lighting- Smart roads- Structural health monitoring - Surveillance- Emergency response - Environment: Weather monitoring- Air Pollution Monitoring- Noise pollution monitoring- Forest Fire Detection - River Floods Detection - Retail: Inventory Management - Smart payments- Smart vending machines - Agricultural: Smart irrigation - Green House Control- Health& Lifestyle: Health & Fitness Monitoring - Wearable Electronics.
III	IOT and M2M: Introduction- M2M - Difference between IOT and M2M - Need for IOT systems management - Simple Network Management Protocol(SNMP) - Limitations of SNMP - IOT Design Methodology: Purpose and requirement specification - Process specification - Domain Model specification- Information Model specification- Service specification- IOT level specification - Functional view specification- Operational view specification - Device and component integration - Application Development - Case study on IOT system for Weather Monitoring.
IV	IOT Systems Logical Design Using Python: Python data types and structures: Lists - Tuples - Dictionaries - Type conversions - Packages - Date/Time operations - Classes - Python packages of interest for IOT: JSON-XML - HTTPLib & URLLib - SMTPLib.
V	IOT physical devices & Endpoints: What is an IOT device- Basic building blocks of an IOT device- Exemplary device: Raspberry PI - About the board- Linux on Raspberry PI- Other IOT devices - IOT Physical servers & Cloud offerings: Amazon Web services for IOT: Amazon EC2 - Amazon Autoscaling- Amazon S3 - Amazon RDS - Amazon DynamoDB- Amazon Kinesis.

1	Vijay Madiseti and Arshdeep Bahga, “Internet of Things: (A Hands-on Approach)”, Universities Press (INDIA) Private Limited 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.
----	--

2.	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications 2013, 1st Edition,.
3	WaltenegusDargie, ChristianPoellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice" 4..CunoPfister, "Getting Started with the Internet of Things", O'Reilly Media 2011
Web Resources	
1.	https://www.simplilearn.com
2.	https://www.javatpoint.com
3.	https://www.w3schools.com

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	2	3	3	3	3
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	12	11	15	15	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Instructional Hours	Marks		
									CIA	External	Total
EC3	Introduction to Data Science	Elective	3	-	-	-	3	3	25	75	100

Learning Objectives

LO1	To learn about basics of Data Science and Big data.
LO2	To learn about overview and building process of Data Science.
LO3	To learn about various Algorithms in Data Science.
LO4	To learn about Hadoop Framework.
LO5	To understand Data Science with case study .

UNIT	Contents	No. of Hours
I	Introduction: Benefits and uses – Facets of data – Data science process – Big data ecosystem and data science	12
II	The Data science process: Overview – research goals - retrieving data - transformation – Exploratory Data Analysis – Model building .	12
III	Algorithms : Machine learning algorithms – Modeling process – Types – Supervised – Unsupervised - Semi-supervised	12
IV	Introduction to Hadoop : Hadoop framework – Spark – replacing MapReduce– NoSQL – ACID – CAP – BASE – types	12
V	Case Study: Prediction of Disease - Setting research goals - Data retrieval – preparation - exploration - Disease profiling - presentation and automation	12
Total		60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the basics in Data Science and Big data.	PO1
CO2	Understand overview and building process in Data Science.	PO1, PO2
CO3	Understand various Algorithms in Data Science.	PO3, PO6
CO4	Understand Hadoop Framework in Data Science.	PO4, PO5
CO5	Case study in Data Science.	PO3, PO5
Text Book		
1	Davy Cielen, Arno D. B. Meysman, Mohamed Ali, “Introducing Data Science”, manning publications 2016	
Reference Books		
1.	Roger Peng, “The Art of Data Science”, lulu.com 2016.	
2.	MurtazaHaider, “Getting Started with Data Science – Making Sense of Data with Analytics”, IBM press, E-book.	
3.	Davy Cielen, Arno D.B. Meysman, Mohamed Ali, “Introducing Data Science: Big Data, Machine Learning, and More, Using Python Tools”, Dreamtech Press 2016.	
4.	Annalyn Ng, Kenneth Soo, “Numsense! Data Science for the Layman: No Math Added”, 2017,1st Edition.	
5.	Cathy O'Neil, Rachel Schutt, “Doing Data Science Straight Talk from the Frontline”, O'Reilly Media 2013.	
6.	Lillian Pierson, “Data Science for Dummies”, 2017 II Edition	

Web Resources	
1.	https://www.w3schools.com/datascience/
2.	https://en.wikipedia.org/wiki/Data_science
3.	http://www.cmap.polytechnique.fr/~lepenec/en/post/references/refs/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	11	10

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC3	Microprocessor and Microcontroller	Core	3	-	-	-	3		25	75	100

Learning Objectives

LO1	To introduce the internal organization of Intel 8085 Microprocessor.
LO2	To know about various instruction sets and classifications
LO3	To enable the students to write assembly language programs using 8085.
LO4	To interface the peripheral devices to 8085 using Interrupt controller and DMA interface.
LO5	To provide real-life applications using microcontroller.

UNIT	Contents	No. of Hours
I	Introduction: Organization of a microprocessor based system- Microprocessor instruction set and computer languages- From large computer to single chip microcontrollers- Application: Microprocessor controlled temperature system.	
II	Introduction to 8085 assembly language programming: The 8085 programming model- Instruction classification- Instruction, Data format, and storage- How to write, assemble and execute a simple program.	
III	Overview of the 8085 instruction set - Microprocessor architecture and its operations- Memory classification- A detailed look at the 8085 MPU and its architecture.	
IV	Introduction to 8085 instructions: Data transfer(Copy) operations- Arithmetic operations- Logic operations- Branch operations- Programming techniques: Looping, counting and indexing.	
V	Counters and time delays: Definition- Time delay using one register- Time delay using a register pair- Time delay using a loop within a loop technique- Additional techniques for time delay- Counter design with time delay- Microcontroller Vs Microprocessor- 8051 Microcontroller architecture.	
		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	

CO1	Remember the Basic binary codes and their conversions. Binary concepts are used in Microprocessor programming and provide a good understanding of the architecture of 8085o introduce the internal organization of Intel 8085 Microprocessor..	PO1
CO2	Understanding the 8085 instruction set and their classifications, enables the students to write the programs easily on their own using different logic	PO1,PO2
CO3	Applying different types of instructions to convert binary codes and analyzing the outcome. The instruction set is applied to develop programs on multibyte arithmetic operations.	PO4,PO6
CO4	Analyze how peripheral devices are connected to 8085 using Interrupts and DMA controller.	PO4,PO5,PO6
CO5	An exposure to create real time applications using microcontroller.	PO3,PO6
Text Book		
1	R. S. Gaonkar- "Microprocessor Architecture- Programming and Applications with 8085"- 5th Edition- Penram International Publications,2009. [For unit I to unit IV]	
2	Soumitra Kumar Mandal -"Microprocessors and Microcontrollers – Architectures, Programming and Interfacing using 8085, 8086, 8051", Tata McGraw Hill Education Private Limited. [for unit V].	
Reference Books		
1.	Mathur- "Introduction to Microprocessor"- 3rd Edition- Tata McGraw-Hill -1993.	
2.	Raj Kamal - "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.	

3.	Krishna Kant, “Microprocessors and Microcontrollers – Architectures, Programming and System Design 8085, 8086, 8051, 8096”, PHI, 2008
Web Resources	
1.	E-content from open source libraries
2.	https://www.bing.com/ , https://theopennotes.in/

Mapping with Programme Outcomes:

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

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CI	A	External
SEC-4	Practical- PHP PROGRAMMING	Skill Enha. Course	-	-	2	-	2		50	50	100
Learning Objectives											
LO1	To provide the necessary knowledge on basics of PHP.										
LO2	To design and develop dynamic, database-driven web applications using PHP version.										
LO3	To get an experience on various web application development techniques.										

LO4	To learn the necessary concepts for working with the files using PHP.	
LO5	To get a knowledge on OOPS with PHP.	
S.No	List of Exercises	No. of Hours
1.	Create a simple HTML form and accept the user name and display the name through PHP echo statement.	
2.	Write a PHP script to redirect a user to a different page.	
3.	Write a PHP function to test whether a number is greater than 30, 20 or 10 using ternary operator	
4.	Create a PHP script which display the capital and country name from the given array. Sort the list by the name of the country	
5.	Write a PHP script to calculate and display average temperature, five lowest and highest temperatures.	
6.	Create a script using a for loop to add all the integers between 0 and 30 and display the total.	
7.	Write a PHP script using nested for loop that creates a chess board.	
8.	Write a PHP function that checks if a string is all lower case.	
9.	Write a PHP script to calculate the difference between two dates.	
10	Write a PHP script to display time in a specified time zone	
	Total	30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Write PHP scripts to handle HTML forms	PO1,PO4,PO6
CO2	Write regular expressions including modifiers, operators, and metacharacters.	PO2,PO5,PO7.
CO3	Create PHP Program using the concept of array.	PO3,PO4,PO5.
CO4	Create PHP programs that use various PHP library functions	PO2,PO3,PO5
CO5	Manipulate files and directories.	PO3,PO5,PO6.
Text Book		

1	VIKRAM VASHWANI- PHp and MY SQL Mc Hill- 2005 Head First PHP & MySQL: A Brain-Friendly Guide- 2009-Lynn mighley and Michael Morrison.
2	The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL- Alan Forbes
Reference Books	
1.	PHP: The Complete Reference-Steven Holzner.
2.	DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2 nd Edition.
Web Resources	
1.	Opensource digital libraries: PHP Programming
2.	https://www.w3schools.com/php/default.asp

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

SEMESTER IV

Subject Code	Subject Name	C	L	T	P	S	C	I	Marks
--------------	--------------	---	---	---	---	---	---	---	-------

		at eg or y					r e d i t s	n s t . H o u r s	C I A	E x t	T o t a l
CC7	Java Programming	Cor e	4	-	-	4	4	2 5	75	100	
Learning Objectives											
LO1	To provide fundamental knowledge of object-oriented programming										
LO2	To equip the student with programming knowledge in Core Java from the basics up.										
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.										
LO4	To provide fundamental knowledge of object-oriented programming.										
LO5	To equip the student with programming knowledge in Core Java from the basics up.										
UNIT	Contents										No. of Hours
I	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.										15
II	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.										15

III	<p>Exception Handling: <i>try – catch- throw - throws – finally</i> – Built-in exceptions - Creating own Exception classes.</p> <p>Multithreaded Programming: Thread Class - Runnable interface –Synchronization–Using synchronized methods– Using synchronized statement- InterthreadCommunication –Deadlock.</p>	15
IV	<p>I/O Streams: Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.</p> <p>Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes</p>	
V	<p>AWT Controls: The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers.</p>	15
Total		75
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1, PO2, PO6
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO2, PO3, PO8
CO3	Implement multi-threading and I/O Streams of Core Java	PO1, PO3, PO5
CO4	Implement AWT and Event handling.	PO2, PO6
CO5	Use Swing to create GUI.	PO1, PO3, PO6
Text Books:		

1.	Programming with JAVA a Primer – E.BALAGURUSAMY, McGraw Hill,4 th Edition Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999
References :	
1.	Head First Java, O’Rielly Publications,
2.	Y. Daniel Liang, <i>Introduction to Java Programming</i> , 7th Edition, Pearson Education India, 2010
Web Resources	
1.	https://javabeginnerstutorial.com/core-java-tutorial
2.	http://docs.oracle.com/javase/tutorial/
3.	https://www.coursera.org/

Mapping with Programme Outcomes:

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

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	1
Weightage of course contributed to each PSO	14	14	13	14	14	11

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC8	Practical- Java Programming	Core	-	-	5	-	3		50	50	100
Learning Objectives											

LO1	To provide fundamental knowledge of object-oriented programming.	
LO2	To equip the student with programming knowledge in Core Java from the basics up.	
LO3	To enable the students to know about Event Handling .	
LO4	To enable the students to use String Concepts.	
LO5	To equip the student with programming knowledge in to creat GUI using AWT controls.	
S.No	List of Exercise	
1	Write a JAVA program using Multiple Constructors	
2	Write a JAVA program using overloading method	
3	Write a JAVA program using Overriding Method	
4	Write a JAVA program using one-dimensional arrays	
5	Write a JAVA program using Two-dimensional array	
6	Write a program to do String Manipulation using Character Array and perform the following string operations: String length, Finding a character at a particular position, Concatenating two strings	
7	Write a JAVA program implementing interface(s)	
8	Write a JAVA program to create and import package	
9	Write a JAVA program to create and deal multiple threads	
10	Write a JAVA program with throwing your own exception	
11	Write a JAVA program using Applet to Design a Web Page	
12	Write a JAVA program for handling mouse events	
13	Write a JAVA program for handling keyboard events	
	Total	60
	Course Outcomes	Programme Outcome
CO	On completion of this course, students will	

1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.	PO1
2	Implement inheritance, packages, interfaces and exception handling of Core Java.	PO1, PO2
3	Implement multi-threading and I/O Streams of Core Java	PO4, PO6
4	Implement AWT and Event handling.	PO4, PO5, PO6
5	Use Swing to create GUI.	PO3, PO6
Text Book		
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.	
2.	Gary Cornell, <i>Core Java 2 Volume I – Fundamentals</i> , Addison Wesley, 1999.	
Reference Books		
1.	Head First Java, O’Rielly Publications,	
2.	Y. Daniel Liang, <i>Introduction to Java Programming</i> , 7th Edition, Pearson Education India, 2010.	
Web Resources		
1.	https://www.w3schools.com/java/	
2.	http://java.sun.com	
3.	http://www.afu.com/javafaq.html	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	2
CO2	3	3	3	2	2	3
CO3	2	2	1	3	3	3
CO4	3	3	3	3	3	2
CO5	3	3	3	3	3	2
Weightage of course contributed to each PSO	14	14	13	14	14	12

S-Strong M-Medium L-Low

Elective Course 4 -Choose any one - Resource Management Techniques/ Analytics for service industry/Biometrics

IV SEMESTER		
EC 4	Resource management techniques	
Hrs / Week : 3	Hrs / Sem : 45	Credits : 2

UNIT I

Simplex Method : Different forms of Linear Programming Problem – Basic solution, Degenerate solution, Non-Degenerate solution, Basic feasible solution , Improved BFS, Optimum BFS – Minimax Theorem of LPP - Slack, Surplus, Restricted and Unrestricted variables

UNIT II

Theory of Games : Introduction – payoff matrix , fair game, strictly determinable game - Two person zero sum games – The Maximin Minimax principle of game theory – Graphical solution of 2 X N and M X 2 games .

UNIT III

Replacement Problem : Introduction - Replacement of items that Deteriorate with time –Replacement of Items whose Maintenance costs increase with time and the value of money also changes with time - Replacement of items that fail completely – Individual Replacement policy - Group Replacement policy

UNIT IV

Network Scheduling by PERT / CPM : Introduction – Basic concepts : Activities, Nodes, Network, Critical path – Constraints in Networks – Construction of the Network – Various Time calculations in Networks, PERT – PERT calculations.

UNIT V

Queuing Theory : Introduction - Characteristics of queuing systems - Basic queuing process - Customer’s behaviours in the queue - Postulate for the Poisson process - Distribution of arrival time - Distribution of service time - Symbols and Notations – Definition of Transient and Steady states .

TEXT BOOK:

Operations Research - P.K.Gupta, Kanti Swarup and Man Mohan, SultanChand & Sons Publications.

REFERENCE BOOKS:

1. Operations Research - J.A. Mangaladoss , Presi – Persi Publications
2. Operations Research - R.Paneer Selvam, Prentice Hall of India

Subje	Subject Name	Categor	L	T	P	S	C	Marks
-------	--------------	---------	---	---	---	---	---	-------

ct Code		y					redits	CI A	External	Total
EC4	ANALYTICS FOR SERVICE INDUSTRY	Elective	3	-	-	-	3	25	75	100
Learning Objectives										
LO1	Recognize challenges in dealing with data sets in service industry.									
LO2	Identify and apply appropriate algorithms for analyzing the healthcare data.									
LO3	Make choices for a model for new machine learning tasks.									
LO4	To identify employees with high attrition risk.									
LO5	To learn various biomedical signals									
UNIT	Contents								No. Of. Hours	
I	Introduction: Healthcare data sources and basic analytics - Advanced data analytics for health care - Applications and practical systems for healthcare								12	
II	Electronic health records: A survey - Components of EHR - Coding systems - Benefits of EHR- Barriers to adopting EHR - Challenges of using EHR data.								12	
III	Bio medical Image Analysis: Introduction - Bio medical imaging modalities - Object detection - Image segmentation - Feature extraction.								12	
IV	Mining of sensor data in health care: Introduction - Mining sensor data in medical informatics Scope and challenges - Challenges in health care data analysis - Sensor data mining applications - Non clinical health care applications.								12	
V	Biomedical signals: Types of biomedical signals - Social media analytics for healthcare: Social media analysis for detection and tracking of infectious disease outbreaks -Outbreak detection - analyzing and tracking outbreaks								12	
TOTAL HOURS									60	
Course Outcomes									Programme Outcomes	
CO	On completion of this course, students will									
CO1	Understand and critically apply the concepts and methods of business analytics								PO1, PO2, PO3, PO4, PO5, PO6	

CO2	Identify, model and solve decision problems in different settings.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Create viable solutions to decision making problems.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Instill a sense of ethical decision-making and a commitment to the long-run welfare of both organizations and the communities they serve.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis, 2015.	
2	Edwards Martin R, Edwards Kirsten (2016), "Predictive HR Analytics: Mastering the HR Metric", Kogan Page Publishers, ISBN-0749473924	
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	
4	RajendraSahu, Manoj Dash and Anil Kumar. Applying Predictive Analytics Within the Service Sector.	
Reference Books		
1.	Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016	
2.	Fitz-enzJac, Mattox II John (2014), "Predictive Analytics for Human Resources", Wiley, ISBN- 1118940709.	
Web Resources		
1.	https://www.ukessays.com/essays/marketing/contemporary-issues-in-marketing-marketing-essay.php	
2.	https://yourbusiness.azcentral.com/examples-contemporary-issues-marketing-field-26524.html	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	3	3
CO 3	3	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	3
WeightageofcoursecontributedtoeachPSO	14	15	14	15	15	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CI	EA	Total
EC4	Biometrics	Specific Elective	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	Identify the various biometric technologies.										
LO2	Design of biometric recognition.										
LO3	Develop simple applications for privacy										
LO4	Understand the need of biometric in the society										
LO5	Understand the scope of biometric techniques										
UNIT	contents							No. of Hours			
I	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.							6			

II	<p>Face Biometrics: Introduction, Background of Face Recognition, Design of Face Recognition System, Challenges in Face Biometrics, Face Recognition Methods, Advantages and Disadvantages</p> <p>Retina and Iris Biometrics: Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Applications of Iris Biometrics, Advantages and Disadvantages</p>	6
III	<p>Vein and Fingerprint Biometrics: Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Advantages and Disadvantages</p> <p>Privacy Enhancement Using Biometrics: Introduction, Privacy Concerns Associated with Biometric Deployments, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics.</p>	6
IV	<p>Multimodal Biometrics: Introduction to Multimodal Biometrics, Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics,</p> <p>Watermarking Techniques: Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking,</p>	6
V	<p>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.</p>	6
Total		30
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	To understand the basic concepts and the functionality of the Biometrics, Face Biometrics, Types, Architecture and Applications.	PO1, PO3, PO6, PO8
CO2	To know the concepts Retina and Iris Biometrics and Vein and Fingerprint Biometrics.	PO1,PO2,PO3,PO6
CO3	To analyse the Privacy Enhancement and Multimodal Biometrics.	PO3, PO5
CO4	To get analyticalidea on Watrmarking Techniques	PO1, PO2, PO3, PO7

CO5	To Gain knowledge on Future scope of Biometrics, and Study of various Biometric Techniques.	PO2, PO6, PO7
Recommended Text		
1.	Biometrics: Concepts and Applications by G.R Sinha and Sandeep B. Patil, Wiley, 2013	
References Books		
1.	Guide to Biometrics by Ruud M. Bolle, Sharath Pankanti, Nalinik Ratha, Andrew W. Senior, Jonathan H. Connell, Springer 2009	
2.	Introduction to Biometrics by Anil K. Jain, Arun A. Ross, Karthik Nandakumar	
3.	Handbook of Biometrics by Anil K. Jain, Patrick Flynn, Arun A. Ross.	
Web Resources		
1.	https://www.tutorialspoint.com/biometrics/index.htm	
2.	https://www.javatpoint.com/biometrics-tutorial	
3.	https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics	

Mapping with Programme Outcomes:

MAPPING TABLE						
CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	1	2	2	2	2
CO2	2	3	2	3	3	1
CO3	2	2	2	3	3	2
CO4	3	2	1	3	3	2
CO5	3	3	2	3	3	3
Weightage of course contributed to each PSO	13	11	9	14	14	10

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks			
									CI	A		
SEC6	Practical- Advanced Excel	Skill Enha. Course (SEC6)	-	-	2	-	2	2	50	50	100	0
Learning Objectives												
LO1	Handle large amounts of data											
LO2	Aggregate numeric data and summarize into categories and subcategories											
LO3	Filtering, sorting, and grouping data or subsets of data											
LO4	Create pivot tables to consolidate data from multiple files											
LO5	Presenting data in the form of charts and graphs											
S.NO	LIST OF EXERCISES								No. of Hours			
1	<p>Logical operations - Consider the design of a light switch system that can turn the same light on or off in three different places. One switch (A) is installed in the hall on the first floor. Another switch (B) is located on the upstairs landing and the third switch (C) is located on the ground floor. Each of the switches has 2 states (on and off). When an odd number of switches are on, the bulb remains off and in all other cases, the bulb glows. Design a truth table and find the various states of the bulb for various combinations of the 3 switches.</p>											
2	<p>You are given the name, gender, attendance, assignment, midterm and final grades of five students. Find the total of the assessment marks. Students who pass need to have a total score greater than or equal to 50. Display the word "Pass" or "Fail" under a column called Description.</p>											

3	Create worksheet with columns Full name, Last Name, First Name and E-Mail. Give Full Name for ten students. Using text function find and fill Last Name, First Name and E-mail(Last Name_First Name @gmail.com)	
4	Use the functions related to date and time such as Date, Date value, Day, Days, Minute, Month	
5	<p>Data Validation Create excel table with columns Emp.Name, Emp.No, Salary, Bonus, Date of entry, Department. Each column in the Excel table have some rule for writing values. We have to modify Data Validation to be able to enter only correct values into the cells.</p> <p>Rules: Employee number is exactly 5 characters long. Salary can be set in the range 600-2000.</p> <p>Bonus cannot be greater than 10 % of the salary. Date of entry can be set only as today.</p> <p>Department must be one of the values from the list of Departments.</p>	
6	<p>Sorting and filtering Create excel table with columns Course, Level(Certificate, diploma, advanced diploma, all levels), Instructor name, Day(Monday to Friday), Starting time, Duration, Course fee Sort the table by: Course level; then Start time; then course fee Use filtering to show rows for a particular instructor, The day is Monday; and The time is after 17:00.</p>	
7	Create Column chart, Line chart, Bar Chart, Pie chart, Scatter chart for the marks obtained by a student in six semesters.	
8	Share chart with word and ppt	
	Total	30
On completing this course Students will learn		
CO		
CO1	To perform various logical operators	
CO2	To perform various functions	
CO3	To perform data validation	
CO4	To Perform sorting and filtering	PO4, PO5, PO6

CO5	To perform various charts and sharing	PO3, PO8
Text Book		
1	Excel 2019 All	
2	Microsoft Excel 2019 Pivot Table Data Crunching	
Reference Books		
1	Excel 2019 All-in-One for Dummies, Greg Harvey, 1st edition	
Web Resources		
1.	https://www.simplilearn.com	
2	https://www.javatpoint.com	
3	https://www.w3schools.com	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	3	3	3
CO2	3	2	2	3	3	3
CO3	3	3	2	3	3	3
CO4	3	2	2	3	3	3
CO5	3	2	2	3	3	3
Weightage of course contributed to each PSO	15	12	10	15	15	15

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

**THIRD YEAR
SEMESTER V**

Subject Code	Subject Name	C	L	T	P	S	C	I	Marks
---------------------	---------------------	----------	----------	----------	----------	----------	----------	----------	--------------

		at eg or y					r e d i t s	n s t . H o u r s	C I A	E x t e r n a l	T o t a l
CC9	Software Engineering	Core	5	-	-	-	4	5	25	75	100

Learning Objectives

LO1	Gain basic knowledge of analysis and design of systems
LO2	Ability to apply software engineering principles and techniques
LO3	Model a reliable and cost-effective software system
LO4	Ability to design an effective model of the system
LO5	Perform Testing at various levels and produce an efficient system.

UNIT	Contents	No. of Hours	Course Objectives
I	<p>Introduction: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering.</p> <p>Software Life Cycle Models: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.</p>	15	
II	<p>Requirements Analysis and Specification: Requirements gathering and analysis, Software requirements specification (SRS)</p> <p>Software Design: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design</p>	15	

III	Function-Oriented Software Design: Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. User-Interface design: Characteristics of a good interface; basic concepts; types of user interfaces; component based GUI development, a user interface methodology.	15
IV	Coding and Testing: Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing; some general issues associated with testing. Software Reliability and Quality Management: Software reliability; statistical testing; software quality; software quality management system; SEI capability maturity model; personal software process.	15
V	Computer Aided Software Engineering: CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. Software Maintenance: Characteristic of software maintenance; software reverse engineering; software maintenance process models; estimation of maintenance cost.	15
Total		75
Course Outcomes		
Course Outcomes	On completion of this course, students will;	
CO1	Gain basic knowledge of analysis and design of systems	PO1
CO2	Ability to apply software engineering principles and techniques	PO1, PO2
CO3	Model a reliable and cost-effective software system	PO4, PO6

CO4	Ability to design an effective model of the system	PO4, PO5, PO6
CO5	Perform Testing at various levels and produce an efficient system.	PO3, PO6
Text Books		
1.	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018	
References Books		
1.	Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997	
2.	Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill.	
3.	James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	2	2	3
CO2	3	2	2	2	1	2
CO3	3	3	3	2	3	2
CO4	3	3	3	2	2	2
CO5	3	3	3	2	2	2
Weightage of course contribute d to each PO/PSO	15	13	14	10	10	11

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

Subject	Subject Name	Cate	L	T	P	S	C	I	Marks
---------	--------------	------	---	---	---	---	---	---	-------

Code		Category					redits	nt . Hours	CI A	External	Total
CC10	Database Management System	Core	5	-	-	-	4	5	25	75	100
Learning Objectives											
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.										
LO2	To understand the concepts of data base management system, design simple Database models										
LO3	To learn and understand to write queries using SQL, PL/SQL.										
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.										
LO5	To understand the concepts of data base management system, design simple Database models										
UNIT	Contents						No. of Hours				
I	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						15				
II	Design Concepts: Relational database model - logical view of data-keys -Integrity rules - relational set operators - data dictionary and the system catalog - relationships -data redundancy revisited -indexes - codd's rules. Entity relationship model - ER diagram						15				

III	<p>Normalization of Database Tables: Database tables and Normalization – The Need for Normalization – The Normalization Process – Higher level Normal Form.</p> <p>Introduction to SQL: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.</p>	15
IV	<p>Advanced SQL: Relational SET Operators: UNION – UNION ALL – INTERSECT - MINUS. SQL Join Operators: Cross Join – Natural Join – Join USING Clause – JOIN ON Clause – Outer Join. Sub Queries and Correlated Queries: WHERE – IN – HAVING – ANY and ALL – FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function</p>	15
V	<p>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.</p>	15
Total		75

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity-Relationship Model.	PO1, PO2
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)	PO4, PO6
CO4	Classify the different functions and various join operations and enhance the knowledge of handling multiple tables.	PO4, PO5, PO6
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions	PO3, PO5
Text Book		
1	Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition	
2	Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016	
Reference Books		
1.	Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts", McGraw Hill International Publication ,VI Edition	
2.	Shio Kumar Singh , "Database Systems ", Pearson publications ,II Edition	
Web Resources		
1.	Web resources from NDL Library, E-content from open-source libraries	

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

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

Subject Code	Subject Name	Category	L	T	P	S	C	I	Marks		
									redits	Inst. Hours	CIA
CC11	Image Processing	Elective	4	-	-	-	4	4	25	75	100
Learning Objective											
LO1	To learn fundamentals of digital image processing.										
LO2	To learn about various 2D Image transformations										
LO3	To learn about various image enhancement processing methods and filters										
LO4	To learn about various classification of Image segmentation techniques										
LO5	To learn about various image compression techniques										
UNIT	Contents									No. of Hours	

I	Introduction & Fundamentals: Definition of image and Digital image processing - Examples of Digital image processing- Fundamental steps in Digital image processing- Components of image processing system- Image acquisition- A simple image model- Zooming and shrinking of digital image.	12
II	Image enhancement in spatial domain: Introduction- Mathematical analysis of enhancement in spatial domain- Basic gray level transformation- Histogram processing- Histogram equalization - Histogram matching- Image enhancement using arithmetic and logical operation- Basic transformation- Basics of spatial filtering- Image enhancement infrequency domain: One dimensional fourier transform and its inverse- Two dimensional fourier transform and its inverse- Basics of filtering in frequency domain- Homomorphic filtering.	12
III	Color image processing: Introduction- Advantages of Color image processing- Categories of Color image processing- Color fundamentals- Primary colors - Secondary colors- Primary and secondary colors for pigments- Characteristics that are used for differentiating different colors- Color models- conversion between color models- Pseudo color image processing- Color transformation- Color image smoothing and sharpening- Color segmentation.	12
IV	Image Compression: Introduction-Mathematical analysis- Types of data redundancies- Image compression model - Compression strategies- Morphological Image processing: Introduction- Basic concept of set theory- Logic operations involving binary images- Dilation and erosion- opening and closing.	12
V	Feature extraction and image segmentation: Introduction- Classification of features- Features of an image - Attributes of features- Complete process of feature extraction -Image segmentation - Thresholding- Region based segmentation.	12
Total		60

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the fundamental concepts of digital image processing.	PO1
2	Understand various 2D Image transformations	PO1, PO2
3	Understand image enhancement processing techniques and filters	PO4, PO6

4	Understand the classification of Image segmentation techniques	PO4, PO5, PO6
5	Understand various image compression techniques	PO3, PO5
Text Book		
1	Abhishak Yadav, Poonam Yadav, Digital Image Processing, University Science Press, New Delhi, 2009 S Jayaraman, S Esakkirajan, T Veerakumar, Digital image processing ,Tata McGraw Hill, 2015	
2	Gonzalez Rafel C, Digital Image Processing, Pearson Education, 2009	
Reference Books		
1.	1. Jain Anil K , Fundamentals of digital image processing: , PHI,1988	
2.	2. Kenneth R Castleman , Digital image processing:, Pearson Education,2/e,2003	
3.	3. Matt William K , Digital Image Processing: , John Wiley,4/e,2007	
Web Resources		
1.	https://kanchiuniv.ac.in/coursematerials/Digital%20image%20processing%20-Vijaya%20Raghavan.pdf	
2.	http://sdeuoc.ac.in/sites/default/files/sde_videos/Digital%20Image%20Processing%203rd%20ed.%20-%20R.%20Gonzalez%2C%20R.%20Woods-ilovepdf-compressed.pdf	
3.	https://dl.acm.org/doi/10.5555/559707	
4.	https://www.ijert.org/image-processing-using-web-2-0-2	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
Weightage of course contributed to each PSO	15	14	11	15	10	10

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

Subject	Subject Name	Categ	L	T	P	S	C	I	Marks
---------	--------------	-------	---	---	---	---	---	---	-------

Code		ory					r e d i t s	n s t . H o u r s	C I A	E x t e r n a l	Tot al
CC12	Practical - Image Processing	core		-	5	-	4		50	50	100
Learning Objective											
LO1	To learn fundamentals of digital image processing.										
LO2	To learn about various 2D Image transformations										
LO3	To learn about various image enhancement processing methods and filters										
LO4	To learn about various classification of Image segmentation techniques										
LO5	To learn about various image compression techniques										
S.N	O	LIST OF EXERCISES								No. of Hours	
1		Perform 2D Linear Convolution, Circular Convolution between two 2D matrices.									
2		Perform Discrete Fourier Transform(DFT), Discrete Cosine Transform(DCT) of 4x4 gray scale image									
3		Perform Brightness enhancement, Contrast Manipulation, Image negative of an image.									
4		Perform threshold operation on an image.									
5		Perform Edge detection using different edge detectors.									
6		Perform Dilation and Erosion operation.									
7		Perform Opening and closing operations									

8	Read a colour image and separate the image into red, blue and green planes.	
---	---	--

Elective Course - EC5- Choose anyone - Cloud Computing/ Data Analytics using R/ Natural Language Processing

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CI	Ext	Total
EC5	Cloud Computing	core	4	-	-	-	3	4	25	75	100

Course Objective

LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, benchmarking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

UNIT	Contents	No. of Hours
------	----------	--------------

<p>I</p>	<p>Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications: Cloud computing for health care, Energy systems, Government, Education .</p> <p>Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements – Billing.</p>	<p>12</p>
<p>II</p>	<p>Cloud Services</p> <p>Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines</p> <p>Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage</p> <p>Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service</p> <p>Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notification Services - Media Services</p> <p>Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network</p>	<p>12</p>

III	<p>Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight</p> <p>Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation</p> <p>Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory</p> <p>Open Source Private Cloud Software: CloudStack – Eucalyptus – OpenStack</p> <p>Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance</p>	12
IV	<p>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).</p>	12
V	<p>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.</p> <p>Case Studies: Cloud Computing for Healthcare – Cloud Computing for Education.</p>	12
Total		60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO 1	Understand the fundamental concepts and Technologies in Cloud Computing.	PO1
CO 2	Able to understand various cloud service types and their uses and pitfalls.	PO1, PO2

CO 3	Able to understand Cloud Architecture and Application design.	PO4, PO5
CO 4	Understand the various aspects of application design, benchmarking and security in the Cloud.	PO4, PO5, PO6
CO 5	Understand various Case Studies in Cloud Computing.	PO3, PO6
Text Book		
1	ArshdeepBahga, Vijay Madiseti, <i>Cloud Computing – A Hands On Approach</i> , Universities Press (India) Pvt. Ltd., 2018	
Reference Books		
1.	Anthony T Velte, Toby J Velte, Robert Elsenpeter, <i>Cloud Computing: A Practical Approach</i> , Tata McGraw-Hill, 2013.	
2.	Barrie Sosinsky, <i>Cloud Computing Bible</i> , Wiley India Pvt. Ltd., 2013.	
3.	David Crookes, <i>Cloud Computing in Easy Steps</i> , Tata McGraw Hill, 2015.	
4.	Dr. Kumar Saurabh, <i>Cloud Computing</i> , Wiley India, Second Edition 2012.	
Web Resources		
1.	https://en.wikipedia.org/wiki/Cloud_computing	
2.	https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7	
3.	https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838-CDW-Cloud-Computing-Reference-Guide.pdf	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	2
CO2	3	3	2	3	3	2
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	2
CO5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	14	11	15	15	10

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
EC5	Data analytics using R	Core	4	-	-	-	3	4	25	75	100
Course Objective											
C1	To understand the problem solving approaches										
C2	To learn the basic programming constructs in R Programming										
C3	To learn the basic programming constructs in R Programming										
C4	To use R Programming data structures - lists, tuples, and dictionaries.										
C5	To do input/output with files in R Programming.										
UNIT	Contents							No. of Hours			
I	Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model							15			

II	<p>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</p>	15
III	<p>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</p>	15
IV	<p>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 R PROGRAMMING .</p>	15

V	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	15
Total		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
1	Work with big data tools and its analysis techniques.	PO1
2	Analyze data by utilizing clustering and classification algorithms.	PO1, PO3
3	Learn and apply different mining algorithms and recommendation systems for large volumes of data.	PO2, PO6
4	Perform analytics on data streams.	PO4, PO5, PO6
5	Learn NoSQL databases and management.	PO5, PO6
Text Book		
1	Roger D. Peng, "R Programming for Data Science", 2012	
2	Norman Matloff, "The Art of R Programming- A Tour of Statistical Software Design", 2011	
Reference Books		
1.	1. Garrett Golemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions and Simulations", 1st Edition, 2014	
2.	Venables, W.N., and Ripley, "S programming", Springer, 2000.	
Web Resources		
1.	https://www.simplilearn.com	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	3	3
CO2	3	3	2	3	2	2
CO3	3	2	3	3	3	2
CO4	3	2	3	2	3	3

CO5	2	3	3	3	3	3
Weightage of course contribute to each PSO	14	13	14	14	14	13

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CI A	External	Total
EC5	NATURAL LANGUAGE PROCESSING	Elect	4	-	-		3	25	75	100

Learning Objectives

LO1	To understand approaches to syntax and semantics in NLP.
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.
LO3	To understand approaches to discourse, generation, dialogue and summarization within NLP.
LO4	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
LO5	To understand current methods for statistical approaches to machine translation.

UNIT	Contents	No. Of. Hours
I	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.	12
II	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.	12
III	Semantic analysis and Discourse Processing: Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.	12
IV	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.	12
V	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 NetStemmers- POS Tagger- Research Corpora SSAS.	12
Total hours		60

Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Describe the fundamental concepts and techniques of natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain a broad understanding of text data.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Analyze large volume text data generated from a range of real-world applications. Use NLP methods to perform topic modelling.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Daniel Jurafsky, James H. Martin, "Speech & language processing", Pearson publications.	
2	Allen, James. Natural language understanding. Pearson, 1995.	
Reference Books		
1.	Pierre M. Nugues, "An Introduction to Language Processing with Perl and Prolog", Springer	
Web Resources		
1.	https://en.wikipedia.org/wiki/Natural_language_processing	
2.	https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-NLP	

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	2	3	3	3	2	3
CO 3	3	3	3	3	3	3
CO 4	3	2	3	3	2	3
CO 5	3	3	3	3	3	3
WeightageofcoursecontributedtoeachPSO	14	14	15	15	13	15

Mini Project : Individual or group of maximum three members- Project report should be submitted for external evaluation. Internal 50 marks, External 50 marks

Mini Project - Students will take a specific problem with a front-end and back-end(involving Database Management Systems) for the mini project and solve it and submit a report. Further each student will participate in regular project review with project guide/faculty.

Subject Code	Subject Name	Category	L	T	P	S	C r e d i t s	I n s t . H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
CC13	MINI PROJECT with viva voce	Core	-	-	5	-	4	5	50	50	100
<p align="center">Develop E-commerce platform where a customer can register and buy a product Bus/Train Reservation system Store/Insurance Management system Courier service system Library Management system etc with your own interest of database and language</p> <p align="center">Learning Objectives</p>											
LO1	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.										

LO2	To understand the concepts of data base management system, design simple Database models		
LO3	To learn and understand to write queries		
LO4	To enable the students to learn the designing of data base systems, foundation on the relational model of data and normal forms.		
LO5	To understand the concepts of data base management system, design simple Database models		
	Total		75
Course Outcomes		Programme Outcomes	
CO	On completion of this course, students will		
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.	PO1	
CO2	Understand the basic concepts of Data Model	PO1, PO2	
CO3	Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data	PO4, PO6	
CO4	Enhance the knowledge of handling multiple tables.	PO4, PO5, PO6	
CO5	Learn to design Data base operations and implementation	PO3, PO4	
Web Resources			
1.	Web resources from NDL Library, E-content from open-source libraries		

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	3	2
CO2	3	3	1	2	2	2
CO3	2	2	3	3	3	3
CO4	2	2	3	3	3	1
CO5	2	3	3	3	3	3
Weightage of course contributed to each PSO	12	12	13	14	14	11

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

Internship: The students should submit certificate of attendance from the industry along with report for evaluation.

Industrial visit/Field Visit/ Knowledge updation activity: A report should be submitted for evaluation.

SEMESTER VI

Subject Code	Subject Name	Category	L	T	P	S	C r e d i t s	I n s t r u c t i o n a l H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
CC14	Computer Networks	Core	5	-	-	-	4	5	25	75	100
Course Objective											
LO1	To learn the basic concepts of Data communication and Computer network										
LO2	To learn about wireless Transmission										
LO3	To learn about networking and data link layer.										
LO4	To study about Network communication.										
LO5	To learn the concept of Transport layer										
UNIT	Contents										No. of Hours
I	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										15

II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.	15
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth.	15
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.	15
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography	15
	Total	75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models	PO1
CO2	To gain knowledge on Telephone systems using wireless network	PO1, PO2
CO3	To understand the concept of MAC	PO4, PO6
CO4	To analyze the characteristics of Routing and Congestion control algorithms	PO4, PO5, PO6
CO5	To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS	PO3, PO4

Text Book	
1	A. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.

Reference Books	
1.	B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2017
2.	F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008
3.	D. Bertsekas and R. Gallager, “Data Networks”, 2nd Edition, PHI, 2008.
4.	Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002
Web Resources	
1.	https://en.wikipedia.org/wiki/Computer_network
2.	https://citationsy.com/styles/computer-networks

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	3	2	3
CO2	3	2	2	2	2	2
CO3	3	2	3	3	2	3
CO4	3	2	2	2	2	2
CO5	3	2	2	2	2	3
Weightage of course contributed to each PSO	15	11	11	12	10	13

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

Subject	Subject Name	Cate	L	T	P	S	C	I	Marks
---------	--------------	------	---	---	---	---	---	---	-------

Code		gory					r e d i t s	n e t . H o u r s	C I A	E x t e r n a l	T o t a l
CC15	.Net Programming	Core	5	-	-	-	4	5	25	75	100
Course Objective											
C1	To identify and understand the goals and objectives of the .NET framework and ASP.NET .										
C2	To develop ASP.NET Web application using standardcontrols.										
C3	To implement file handling operations.										
C4	To handles SQL Server Database using ADO.NET.										
C5	Understand the Grid view control and XML classes.										
UNIT	Contents								No. of Hours		
I	The .NET framework: The .NET Programming Framework - VB.NET, C# and the .NET languages- VB.NET versus VB Script and Visual Basic 6 - The Common Language Runtime - The .NET class library - ASP.NET - Visual Studio .NET - Learning the .NET languages: The .NET languages - Data types - Declaring variables - Scope and Accessibility - Variable operations - Object based manipulation - Conditional structures-Loop structures								18		
II	Types objects and Namespaces: The basics about classes - Value types and reference types - Advanced class programming - Understanding namespaces and assemblies - Setting up ASP.NET and IIS: Web servers and you - IIS Manager - Installing ASP.NET - Migrating from ASP								18		
III	ASP.NET Applications: ASP.NET Applications - Code Behind - The global .aspx application file - Understanding ASP.NET classes - ASP.NET configuration - Web form fundamentals: A simple page applet - A deeper look at HTML control classes- Assessing HTML server controls								18		

IV	Web controls: Stepping up to web controls - Web control classes - AutoPostBack and web control events - A simple web page applet - assessing web controls- Using Visual Studio .NET: The Promise of Visual Studio .NET - Starting a visual studio .NET project - The web form designer - Writing code.	18
V	Validation and Rich controls: Validation - A simple validation example - Understanding regular expressions - State Management: The problem of state - View state - Session state - Application state	18
Total		90
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Develop working knowledge of C# programming constructs and the .NET Framework	PO1, PO2, PO6
2	To develop a software to solve real-world problems using ASP.NET	PO2, PO3, PO5
3	To Work On Various Controls Files	PO1, PO3, PO6
4	To create a web application using VS.NET .	PO2, PO6
5	To develop web applications using rich controls	PO1, PO3, PO6
Text Book		
1	Mathew, Mac Donald, The Complete Reference ASP.NET, Tata McGraw-Hill,2015	
2	. SvetlinNakov,VeselinKolev& Co, Fundamentals of Computer Programming with C#,Faber publication,2019.	
Reference Books		
1.	Herbert Schildt, The Complete Reference C#.NET, TataMcGraw-Hill,2017.	
2.	Kogent Learning Solutions, C# 2012 Programming Covers .NET 4.5 Black Book, Dreamtechpres,2013.	
3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach& Associates Inc.2016.	
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.	
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010,APRESS,2010.	
Web Resources		

1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	3	3	2	3
CO2	3	2	2	3	3	3
CO3	3	3	3	2	3	3
CO4	2	2	1	3	3	2
CO5	3	3	3	3	3	3
Weightage of course contributed to each PSO	14	13	12	14	14	14

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

Subject Code	Subject Name	Category	L	T	P	S	C r e d i t s	I n s t . H o u r s	Marks		
									C I A	E x t e r n a l	T o t a l
CC16	Operating System	Core	4	-	-	-	4	4	25	75	100

- To acquire the fundamental knowledge of the operating system architecture and components and to know the various operations performed by the operating system.
- Understand the basic working process of an operating system.
- Understand the importance of process and scheduling.
- Understand the issues in synchronization and memory management.

Unit I

Introduction: What Operating system do? – Computer System Organization – Computer System Architecture – Operating System Structures- Operating System Operation. **System Structures:** Operating System Services – System Calls – System Programs – Operating System Design and Implementation- Operation System Generation- System Boot. (12L)

Unit II

Process Concept: Process Concept- Process Scheduling –Operation on Processes- Inter Process Communication- Example of IPC System – Communication in Client – Server system. **Process Scheduling :** Basic concept-Scheduling criteria- Scheduling algorithm-Thread scheduling- Multiple Processor Scheduling-Real Time CPU Scheduling-Operating system example- Algorithm evaluation. (12L)

Unit III

Synchronization: Background - The Critical section problem-Peterson’s solution - Semaphores – Classic problems of Synchronization. **DeadLocks:** System model-Deadlock Characterization- Methods for handling deadlocks- Deadlock Prevention-Deadlock Avoidance-Deadlock detection - Recovery from deadlock. (12L)

Unit IV

Memory Management: Background – Swapping - Contiguous Memory allocation – Segmentation – paging. **Virtual Memory Management :** Background - Demand paging - and Write-page replacement-Allocation of Frames - Thrashing. (12L)

Copy

Unit V

File System : File Concept-Access Method-Directory and Disk Structure--File Sharing-

Protection. **Implementing File System:** File System Structure - File System implementation- Directory implementation-Allocation Methods - Free Space Management. **Mass Storage Structure:** Overview of Mass Storage Structure-Disk Structure - Disk Scheduling - Disk Management. (12L)

Text Book:

Operating System Concepts – Abraham Silberscartz, Peter Baer Galvin, and Greg Gange. Addison Wesley Publishing Company – Ninth Edition.

Reference Books:

1. Operating System: Internal and Design Principles – Fifth Edition, William Stalling ,PHI Learning Private Limited.
2. Understanding Operating Systems: Ida M.Flynn ,Ann McIverMcHoes.

Subject Code	Subject Name	Category	L	T	P	S	C	I	Marks		
									redits	Hours	CI A
CC17	Practical .Net Programming Lab(ASP.NET)	Core	-	-	5	-	4	5	25	75	100
Course Objective											
LO1	To develop ASP.NET Web application using standard controls.										
LO2	To create rich database applications										
LO3	To implement file handling operations.										
LO4	To implement XML classes.										
LO5	To utilize ASP.NET security features for authenticating the website										

Sl. No	Programs	No. of Hours
	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. 7. Web application using data controls 8. Data base application to perform insert, update and delete operations. 9. Data base application using data controls to perform insert, delete, edit operation 10. Data base application using data controls to perform paging and sorting operation 11. Implement the XML classes 12. Online examination using ASP.NET controls	75
	Total	75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	To create web applications and implement various controls	PO1, PO2, PO4
CO2	Create web pages in Rich control.	PO3, PO5
CO3	Develop knowledge about file handling operations	PO1, PO4, PO5
CO4	An ability to design XML classes	PO2, PO4, PO6
CO5	To develop a software to solve real-world problems using ASP.NET	PO1, PO3, PO5, PO6
Text Book		
1	Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 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 Black Book, Dreamtech pres, 2013.	

3.	Anne Boehm, Joel Murach, Murach's C# 2015, Mike Murach & Associates Inc.2016.
4.	DenielleOtey, Michael Otey, ADO.NET: The Complete reference, McGrawHill,2008.
5.	Matthew MacDonald, Beginning ASP.NET 4 in C# 2010, APRESS,2010.
Web Resources	
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

Mapping with Programme Outcomes:

CO/ PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	1	2	1	2
CO2	3	3	2	2	3	3
CO3	3	3	2	3	3	2
CO4	3	2	3	2	2	3
CO5	3	2	2	2	3	3
Weightage of course contributed to each PSO	15	12	10	11	12	13

**Elective Course 6 - EC6- Choose anyone - Artificial Intelligence/ Artificial Neural Network/
Cyber Forensics**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Instr. Hours	Marks		
									CIA	External	Total
EC6	Artificial Intelligence	Elective	4	-	-	-	3	4	25	75	100
Course Objective											
C1	To learn various concepts of AI Techniques.										
C2	To learn various Search Algorithm in AI.										
C3	To learn probabilistic reasoning and models in AI.										
C4	To learn about Markov Decision Process.										
C5	To learn various type of Reinforcement learning.										
UNIT	Contents									No. of Hours	
I	Introduction: What is AI- The foundations of Artificial Intelligence- The history of Artificial Intelligence- The state of the art - Risks and benefits of AI Intelligent Agents : Agents and Environments- The nature of Environments - Specifying the task environment- Properties of task environments.									12	
II	Solving Problems by Searching: Problem solving agents - Example Problems - Search algorithms - Uninformed search strategies : Breadth-first search, Dijkstra's algorithm or Uniform-cost search - Depth-first search and the problem of memory - Informed (Heuristic) Search Strategies: Greedy best-first search - A* search.									12	

III	Learning from Examples :Forms of learning - Supervised learning - Example Problem: Restaurant waiting- Learning Decision Trees - Expressiveness of decision trees - Learning decision trees from example . Deep Learning : Introduction - Simple feed forward Networks- Networks as complex functions-Gradients and learning - Applications: Vision - Natural Language Processing.	12
IV	. Computer Vision: Introduction - Image formation - Simple Image features - Edges - Texture - Optical flow- Segmentation of natural images - Classifying images - Image classification with convolutional neural network - Detecting objects - Using computer vision - Understanding what people are doing - Linking pictures and Words	12
V	Robotics: Robots - Robot hardware - Types of robots from the hardware perspective - Sensing the world - Producing motion - What kind of problem is robotics solving - Humans and Robots-Coordination - Learning to do what humans want - Application Domains.	12
Total		60
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the various concepts of AI Techniques.	PO1
2	Understand various Search Algorithm in AI.	PO1, PO2
3	Understand probabilistic reasoning and models in AI.	PO4, PO6
4	Understand Markov Decision Process.	PO4, PO5, PO6
5	Understand various type of Reinforcement learning Techniques.	PO3, PO4
Text Book		
1	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall.	
	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill	
Reference Books		
1.	Trivedi, M.C., “A Classical Approach to Artificial Intelligence”, Khanna Publishing House, Delhi.	
2.	SarojKaushik, “Artificial Intelligence”, Cengage Learning India, 2011	
3.	David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010	
Web Resources		
1.	https://github.com/dair-ai/ML-Course-Notes	
2.	https://web.cs.hacettepe.edu.tr/~erkut/ain311.f21/index.html	

EC6	Artificial Neural Networks	Elective	4	-	-	-	3	4	25	75	100
Learning Objectives											
LO1	Understand the basics of artificial neural networks, learning process, single layer and multi-layer perceptron networks.										
LO2	Understand the Error Correction and various learning algorithms and tasks.										
LO3	Identify the various Single Layer Perception Learning Algorithm.										
LO4	Identify the various Multi-Layer Perception Network.										
LO5	Analyze the Deep Learning of various Neural network and its Applications.										
UNIT	Contents										No. of Hours
I	Artificial Neural Model- Activation functions- Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem - Multilayer Networks. Learning Algorithms- Error correction - Gradient Descent Rules, Perception Learning Algorithm, Perception Convergence Theorem.										12
II	<i>Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, Learning with and without teacher, learning tasks, Memory and Adaptation.</i>										12
III	<i>.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.</i>										12
IV	<i>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</i>										12
V	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										12

		Total	60
Course Outcomes		Programme Outcome	
CO	On completion of this course, students will		
CO1	Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.		PO1
CO2	Learn about the Error Correction and various learning algorithms and tasks.		PO1, PO2
CO3	Learn the various Perception Learning Algorithm.		PO4, PO5
CO4	Learn about the various Multi-Layer Perception Network.		PO4, PO5, PO6
CO5	Understand the Deep Learning of various Neural network and its Applications.		PO3, PO5
Text Book			
1	Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill- Second Edition.		
2.	“Neural Network- A Comprehensive Foundation”- Simon Haykins, Pearson Prentice Hall, 2nd Edition, 1999.		
Reference Books			
1.	Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.		
Web Resources			
1.	https://www.w3schools.com/ai/ai_neural_networks.asp		
2.	https://en.wikipedia.org/wiki/Artificial_neural_network		
3.	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12		

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	2	3	2	3	2	2
Weightage of course contributed to each PSO	14	14	11	15	10	10

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

Subject Code	Subject Name	Category	L	T	P	S	C r e d i t s	I n s t . H o u r s	Marks		
									CI A	E x t e r n a l	Tot al
EC6	Cyber Forensics	Elective	4	-	-	-	3	3	25	75	100
Learning Objectives											
LO1	Understand the definition of computer forensics fundamentals.										
LO2	To study about the Types of Computer Forensics Evidence										
LO3	Understand and apply the concepts of Duplication and Preservation of Digital Evidence										
LO4	Understand the concepts of Electronic Evidence and Identification of Data										
LO5	To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.										
UNIT	Contents							No. of Hours			
I	Overview of Computer Forensics Technology: Computer Forensics Fundamentals: What is Computer Forensics Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer Forensics Technology: Types of Business Computer Forensic, Technology–Types of Military Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.							6			
II	Computer Forensics Evidence and capture: Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options, Obstacles, Types of Evidence,							6			

III	Duplication and Preservation of Digital Evidence: Processing steps, Legal Aspects of collecting and Preserving Computer forensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	6
IV	Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6
V	Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction Of E-Mail, Damaging Computer Evidence, Documenting The Intrusion on Destruction of Data, System Testing.	6
Total		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Understand the definition of computer forensics fundamentals.	PO1
CO2	Evaluate the different types of computer forensics technology.	PO1, PO2
CO3	Analyze various computer forensics systems.	PO4, PO6
CO4	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
CO5	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO8
Text Book		
1	John R. Vacca, "Computer Forensics: Computer Crime Investigation", 3/E ,Firewall Media, New Delhi, 2002.	
Reference Books		
1.	Nelson, Phillips Enfinger, Stuart, "Computer Forensics and Investigations" Enfinger, Stuart, CENGAGE Learning, 2004.	
2.	Anthony Sammes and Brian Jenkinson, "Forensic Computing: A Practitioner's Guide", Second Edition, Springer-Verlag London Limited, 2007.	
3.	.Robert M.Slade, " Software Forensics Collecting Evidence from the Scene of a Digital Crime", TMH 2005.	
Web Resources		
1.	https://www.vskills.in	
2.	https://www.hackingarticles.in/best-of-computer-forensics-tutorials/	

CC18 - Core - Major Project with Viva voce- Individual or group of maximum three members- Project report should be submitted for external evaluation. Internal 50 marks, External 50 marks.

Students who couldn't appear for Naan Muthalvan Course in a particular semester or who have failed in Naan Muthalvan course should write the following self-study papers (External 100 marks)

Semester	Title of the course
II	Soft skills for employability
III	HTML
IV	Internet Fundamentals
V	Office Automation
VI	C Programming

SOFT SKILLS FOR EMPLOYABILITY

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	-	-	-	-	2	-	0	100	100
Learning Objectives									
LO1	The course aims to acquaint the students with some very relevant and necessary soft skills and also to help them to develop their personality as well as to be self-motivated.								
LO2	To get the knowledge about the meditation techniques and mental conditioning								
LO3	To get the knowledge about the social skills and etiquette								
LO4	To get the knowledge about the communication and negotiation skills								
LO5	To get the knowledge about the preparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere								
Prerequisites: None									
Unit	Contents								

I	<p>Minding the Mind: This Unit will focus on meditation techniques and mental conditioning Understanding YOU, which denotes 'Your Own Universe', wherein a person will be encouraged to self-introspect and critically analyse oneself.</p> <p>Self-Analysis IceBreaker WarmingUp</p>
II	<p>The Charming Skills: This Unit will focus on training the students to develop and enhance their social skills, etiquette and basic personal grooming.</p> <p>Introduction Social Skill</p> <p>Etiquette (This will be broad-based delving on various etiquettes necessary for varied areas such as general conversation, table party, official meets and social media)</p>
III	<p>The Communication Mechanism : This Unit will focus on developing skills in both verbal and non-verbal communications (body language, framing emails, and social media communications). Moreover, input on importance of graphology will be taught.</p> <p>Introduction to Communication Types of Communication Public Speaking Group Conversation Letter writing and email</p>
IV	<p>The Negotiator: This unit will focus on inculcating good negotiations and conflict management skills.</p> <p>3.6 Introduction to Negotiation The Negotiation Clock Face Assertiveness Matters Traits of Negotiations Factors that Make a Difference Tactics and Values</p>

V	<p>Campus to Corporate: This Unit will focus on training about preparation of resumes, appearing for interviews and handling both after campus issues that people normally face while setting foot on the professional sphere.</p> <p>4.1 The Doorstep 4.2 Resume Preparation/Portfolio Management 4.3 Interviews: The Different Types and How to face the same</p>
---	--

CO	Course Outcomes
CO1	The students will be able to appreciate the significance of soft skills.
CO2	The students will be able to get the personality augmentation with reference to their personal life.

CO3	The students will be able to get the personality augmentation with reference to their professional life.
CO4	The students will get the professional efficiency.
CO5	The course module will enhance the employability quotient of the students
Textbooks	
1.	<i>Bezborah, P.</i> , Soft Skills and Personality Development. Banalata, Dibrugarh.
2.	<i>Hartely C. B.</i> , The Gentlemen's Book of Etiquette and Manual of Politeness. Julia Miller.
3.	<i>Rai, U.</i> , English Language Communication Skills, Himalaya Publishing House
Reference Books	
1.	<i>Amen, K.K. and Ruiz, M.S.</i> , Hand Writing Analysis – The Complete Basic Book. New Page Books, New Jersey.
2.	<i>Gates, S.</i> , The Negotiation Book. TJI International Limited, Cornwall.
3.	<i>Wainright. G.R.</i> , Understand Body Language. Hodder Education, London.

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	I	M			
								n	A	Ext	Tota
							s	t.	ern	al	l
							o	u			
							r				
							s				

	HTML		-	-	-	-	-	-		100	100
--	-------------	--	---	---	---	---	---	---	--	-----	-----

Learning Objectives

LO1	To understand the concepts Tags
LO2	To learn linear data structures-lists and links
LO3	To learn formatted images
LO4	To learn frames and its structures
LO5	To create various style sheets

UNIT	Contents	No.of Hours
I	Introduction to HTML: Designing a Home page – History of HTML – HTML generations-HTML Documents-Anchor tag–Hyperlinks–Sample HTML documents.	15
II	Head and Body section: Header Section –Title-Prologue-Links-Colorful web page –Comments lines Designing the body: Heading printing –Aligning the headings-Horizontal rule-paragraph-Tab settings-Image and pictures-Embedding PNG format Images	15
III	Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists. Table handling: Tables- table creation in HTML- Width of the Tablesandcells-Cellspanningmultiplerows/Columns-Coloringcells– Column specification	15
IV	Frames: Frameset-Definition–Frame definition–Nested Frames Web Page Design Project: Frameset Definition–Animals–Birds–Fish Forms:Action	15

	attributes–Method attributes–Enctype attribute–Drop down list-sample forms	
V	DHTML and Style sheets: Defining styles –Elements of styles- Linking a style sheet to an HTML document–In line styles–Internal & External style sheets– Multiple styles	15
	Total	75

Course Outcomes		Programmeme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of various tags	PO1,PO6
CO2	Understand basic designing	PO2
CO3	Describe the hash function and concepts of tables, designing etc	PO2,PO4
CO4	Solve problem involving style sheets	PO4,PO6
CO5	Apply the attributes in designing webpages	PO5,PO6

TextBook:

WorldWideWebDesignwithHTML,C.Xavier,TMH,2001

ReferenceBook:

1. Internet&WorldWideWeb,H.M.Deital,P.J.Deital&A.B.Goldberg,PearsonEducation
2. Fundamentalsofinformationtechnology,Mathew'slenonandAlxisleon,Vijay Nicoleprivatelimited,Chennai.

MappingwithProgrammeOutcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightageofcourse contributed to each PSO	15	14	13	13	15	14

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

Titleofthe Course/ Paper	SubjectName	Category	L	T	P	S	I n s t. H o u r s	M a r k s		
								CI A	Ext ern al	Tota l
	Internet fundamentals			-	-	-			100	100
Learning Objectives										
LO1	To understand the concepts network									
LO2	To learn various links in internet									
LO3	To learn formatted images									
LO4	To learn frames and its structures									

LO5	To create various styles heets	
UNIT	Contents	No. of Hours
I	Man and Machines- Human Capability of five senses to see, hear, smell, speak and act - Basic Structure of a Computer - Data - Characteristics of a Computer-History of Computers - - Classification of Computers	15
II	Application Software and Programming Languages - Application Software - Packaged Software Products (Off-the-Shelf Products) - Office Automation - Core Banking System - Enterprise Software Products – SAP - Sales Force – Oracle - CRM and ERP - Early High Level Programming Languages - Translators (Compilers and Interpreters)–FORTRAN–BASIC–COBOL–PASCAL-C Language - Web Programming Languages – HTML - Java Script - Objected Oriented Programming with C++ - C++ Language - C# Language - Java Programming - Modern Programming Language– Python - GO Language - Swift Language - Kotlin Language - R Language - Artificial Intelligence Languages - Database Management Software	15
III	Digital Transformation-Data(High Value Commodity)-Digital Transformation in Business-Features of Digital Transformation-	15
	Banking and Financial Services Industry(BFSI) –Human Resource Management – Healthcare - Big Data Analytics in Healthcare - Virtual Reality Wearable medical devices	
IV	Cyber Security-IT Assets-Risk and Vulnerabilities-Computer Security Types - Fundamental Principles of Security – Physical Safety and Security- Access Control-Biometric Access Control- Network Security-AAA Server–Firewall– Malware–Spyware–Adware–Spam ware–Virus –Ransom ware-Worms-Trojan Horse-	15

	<p>– Computer Virus - Types of Computer Viruses -Antivirus Protection-Digital Signature-Cyber Crime-Hacking-Phishing-Spam e-mails -</p> <p>Attack using Malware - ATM Skimming – Ransom ware - Fake News - Deep fake – Cyber bullying –</p>	15
	<p>Textbook</p> <p>Fundamentals of Internet and Emerging Technologies (2021) , C. Xavier, New Age International Publishers Ltd., New Delhi., Chapters 1, 2, 3 and 9 to 16 only.</p> <p>ReferenceBook</p> <ol style="list-style-type: none"> 1. IntroductiontoComputerScience,SecondEdition,ITL EducationSolutionsLtd,PearsonEducation 2. IntroductiontoComputers,PeterNorton,7thEdition, McGrawHillEducation 3. FundamentalsofComputers,V.Rajaram,5thEdition,PHI <p>–</p>	
	Total	75
Course Outcomes		Programmeme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of network	PO1,PO6
CO2	Understand basic languages	PO2
CO3	Describe the security hash function and concepts of Security methods	PO2,PO4
CO4	Solve problem involving malware	PO4,PO6
CO5	Apply Algorithm for secure network	PO5,PO6

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO 1	3	3	3	3	3	3
CO 2	3	3	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

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

	Office Automation	Ext-100
Pre-requisite	Basic skills in Computer operations	
<p>Learning Objectives:(for teachers: what they have to do in the class/lab/field)</p> <ul style="list-style-type: none"> ● The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Powerpoint. ● The course is highly practice oriented rather than regular classroom teaching. ● To acquire knowledge on editor, spreadsheet and presentation software. 		
<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1: Understand the basics of computer systems and its components.</p> <p>CO2: Understand and apply the basic concepts of word processing package.</p> <p>CO3: Understand and apply the basic concepts of electronic spreadsheet software.</p> <p>CO4: Understand and apply the basic concepts of database management system.</p> <p>CO5: Understand and create a presentation using PowerPoint tool.</p>		
<p>Recap:(not for examination) Motivation/previous lecture/relevant portions required for the course)[This is done during 2 Tutorial hours)</p>		
Units	Contents	Required Hours

I	Introductory concepts: Memory unit–CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems & its features: DOS–UNIX–Windows. Introduction to Programming Languages.	17
II	Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets; Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, numbering; printing–Preview, options, merge.	17
III	Spreadsheets: Excel– opening, entering text and data, formatting, navigating; Formulas –entering, handling and copying; Charts– creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.	17
IV	Database Concepts: The concept of database management system; Data field, records, and	17
	files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of data files; Understanding Programming environment in DBMS; Developing menu drive applications in query language(MS–Access).	
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects ,audio inclusion, timers.	17

<p>Extended Professional Component (is apart of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC–CSIR/GATE/TNPSC/others to be solved(To be discussed during the Tutorial hour)</p>	
<p>Skills acquired from the Course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>	
<p>Learning Resources:</p> <ul style="list-style-type: none"> ● Recommended Texts <ol style="list-style-type: none"> 1. Peter Norton, "Introduction to Computers" – Tata McGraw-Hill. ● Reference Books <ol style="list-style-type: none"> 1. Jennifer Ackerman Kettel, Guy Hat- 		
<p style="text-align: center;">Davis, Curt Simmons, "Microsoft 2003", Tata McGraw-Hill.</p> <ul style="list-style-type: none"> ● Web resources : Web content from NDL/ SWAYAM or open source web resource 		

Subject Code	Subject Name	Category	L	T	P	S	C	I	n	Marks			
										r	e	d	s
	PROGRAMMING IN C		-	-	-	-	-	-	-	-	100	100	
Learning Objective													
LO1	To familiarize the students with the Programming basics and the fundamentals of C, Datatypes in C, Mathematical and logical operations.												
LO2	To understand the concept using if statements and loops												
LO3	This unit covers the concept of Arrays and Functions												
LO4	This unit covers the concept of Structurs and unions and Preprocessors												
LO5	To understand the concept of implementing pointers.												
UNIT	Contents										No. of Hours		
I	<p>Overview of C: Importance of C, sample C program, C program structure, executing C program.</p> <p>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.</p> <p>Operators and Expression: Arithmetic, Relational, logical, assignment, increment, decrement, conditional, bitwise and special operators, arithmetic expressions, operator precedence, type conversions, mathematical functions</p> <p>Managing Input and Output Operators: Reading and writing a character, formatted input, formatted output.</p>										15		
II	<p>Decision Making and Branching: Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement.</p> <p>Decision Making and Looping: While, Do-While, For, Jumps in loops.</p>										15		

III	<p>Arrays: Declaration and accessing of one & two-dimensional arrays, initializing two-dimensional arrays, multidimensional arrays.</p> <p>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.</p>	15
IV	<p>Structures and Unions: Defining, giving values to members, initialization and comparison of structure variables, arrays of structure, arrays within structures, structures within structures, structures and functions, unions.</p> <p>Preprocessors: Macro substitution, file inclusion.</p>	15
V	<p>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.</p>	15
Total		75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Remember the program structure of C with its syntax and semantics	PO1,PO3,PO5
CO2	Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)	PO2,PO3,PO6
CO3	Apply the programming principles learnt in real-time problems	PO3,PO4,PO5
CO4	Analyze the various methods of solving a problem and choose the best method	PO4,PO5,PO6
CO5	Code, debug and test the programs with appropriate test cases	PO5,PO6
Text Book		
1	E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.	
Reference Books		
1.	Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.	
2.	Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998	
3.	Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021	

Web Resources	
1.	https://codeforwin.org/
2.	https://www.geeksforgeeks.org/c-programming-language/
3.	http://en.cppreference.com/w/c
4.	http://learn-c.org/
5.	https://www.cprogramming.com/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	2	3	3
CO 3	2	3	2	3	3	2
CO 4	3	3	3	3	3	3
CO 5	3	3	3	3	3	2
Weight age of course contributed to each PSO	14	15	14	14	15	13

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