

**B.Sc.,
ARTIFICIAL INTELLIGENCE**

SYLLABUS

**FROM THE ACADEMIC YEAR
2023 – 2024**

1. Introduction

B.Sc.Artificial Intelligence

Artificial Intelligence or AI, is a branch of computer science that deals with building smart machines that are capable of performing complex tasks that normally require human interference and intelligence. It combines Data Science with real-life data to leverage machines and computers to imitate the decision-making and problem-solving capabilities that the human mind has. Many human mental activities such as writing computer programs, doing mathematics, engaging in common sense reasoning, understanding language, and even driving an automobile are said to demand “intelligence.” Most of the work on building such kinds of systems has taken place in the field called “Artificial Intelligence (AI).” AI systems are developed, undergo experimentation, and are improved.

The course is enabled to include several interdisciplinary areas like: Machine Learning, Deep Learning, Natural Language Processing, Robotics, Artificial Intelligence in Business and Society and The Future of Artificial Intelligence, Operating systems, Databases, Business Intelligence, Big Data, Probability and Statistics, Data Optimization, Statistical Simulation and Data Analysis, Management Decision Analysis, Decision Models and Predictive Analysis. Artificial Intelligence Has Gained Paramount Importance in the computer science domain. Students graduating from the program will have significantly more depth and breadth in the broad area of Data Science and receive all the information they need to work with various kinds of data and statistical data. The programme is designed so that students have in-depth knowledge of the many approaches, aptitudes, methodologies, and instruments needed to deal with corporate data.

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	B.Sc., Artificial Intelligence
Programme Code:	
Duration:	3 years [UG]
Programme Outcomes:	PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study PO2: Communication Skills: Ability to express thoughts and ideas effectively; Communicate with others using appropriate media; confidently share one’s views; demonstrate the ability to listen carefully, read and write analytically, and present complex

information in a clear and concise manner to different groups.

PO3: Critical thinking: Capability to apply analytic; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO4: Problem solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems and apply to real life situations.

PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate and test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

PO7: Cooperation/Team work: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

PO10 Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate and use appropriate software for analysis of data.

PO 11 Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

PO 12 Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

	<p>PO 13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p>PO 14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO 15: Lifelong learning: Ability to acquire knowledge and skills, including learning “how to learn”, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
<p>Programme Specific Outcomes:</p>	<p>PSO1: To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.</p> <p>PSO 2: To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.</p> <p>PSO 3: To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.</p> <p>PSO 4: Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.</p> <p>PSO 5: Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.</p>

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
PSO 1	S	S	L	S	S	S	M	S
PSO 2	S	S	S	S	S	L	S	S
PSO3	M	S	M	S	M	S	L	S
PSO 4	S	S	S	S	S	S	S	S
PSO 5	L	S	S	S	S	S	S	M

S – Strong, M- Medium, L- Low

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 education and scientific front, practical training, devising mathematical models and algorithms for providing solutions to 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 Mathematics 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 application of conceptual knowledge to practical situations. The 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.

Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome/ Benefits
I	Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analysing the world through the literary lens gives rise to a new perspective.	<ul style="list-style-type: none"> ➤ Instill confidence ➤ Create interest for the subject
I,II,III,IV	Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)	<ul style="list-style-type: none"> ➤ Industry ready graduates ➤ Skilled human resource ➤ Equipped with essential skills to be employable
		<ul style="list-style-type: none"> ➤ Training on language and communication skills enable to gain knowledge and exposure in the competitive world.
		<ul style="list-style-type: none"> ➤ Discipline centric skill will improve the Technical know-how of solving real life problems.
III,IV,V& VI	Elective papers	<ul style="list-style-type: none"> ➤ Strengthening the domain knowledge ➤ Introducing the stakeholder to the State-of-Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature ➤ Exposure to industry moulds students into solution providers ➤ Self-learning is enhanced ➤ Developing a research framework and presenting their independent and Intellectual ideas effectively.
Extra Credits: For Advanced Learners / Honors degree		<ul style="list-style-type: none"> ➤ To cater to the needs of peer learners/ research aspirants
Skills acquired from the Courses		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

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

First Year – Semester-I

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
		23	30

Semester-II

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		23	30

Second Year – Semester-III

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		22	30

Semester-IV

Part	List of Courses	Credit	No. of Hours
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		25	30

Third Year Semester-V

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based	22	26
Part-4	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	2
		26	30

Semester-VI

Part	List of Courses	Credit	No. of Hours
Part-3	Core Courses including Project / Elective Based & LAB	18	28
Part-4	Extension Activity	1	-
	Professional Competency Skill	2	2
		21	30

Consolidated Semester wise and Component wise Credit distribution

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

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

MethodsofEvaluati on		
InternalEv aluation	ContinuousInternalAssessmentTest	25 Marks
	Assignments	
	Seminars	
	AttendanceandClassParticipation	
ExternalEv aluation	EndSemesterExamination	75 Marks
	Total	100 Marks
MethodsofAssesm ent		
Recall(K1)	Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions	
Understand /Comprehend(K2)	MCQ,True/False,Shortessays,Conceptexplanations,Shortsumma ryor Overview	
Application (K3)	Suggestidea/conceptwithexamples,Suggestformulae, Solveproblems, Observe,Explain	
Analyze(K4)	Problem- solvingquestions,Finishaprocedureinmanysteps,Differentiate betweenvariousideas,Mapknowledge	
Evaluate(K5)	Longer essay/Evaluationessay,Critiqueorjustifywithprosandcons	
Create(K6)	Checkknowledgeinspecificoroffbeatsituations,Discussion,Debatin gorPresentations	

Eligibility for Admission to B.Sc., Artificial Intelligence:

Candidates who have studied Mathematics in HSC areeligible for this programme

**Template for Curriculum Design for UG Programme in
B.ScArtificial Intelligence
Credit Distribution for UG Programme in Artificial Intelligence
B.ScArtificial Intelligence
First Year
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	Core Courses 3 (CC1, CC21, CC2 2)	5	5
	CC1 Java Programming	3	3
	CC2-1Java Programming Practical	2	2
	CC2-2PHP Scripting – Practical	3	4
	Elective Course 1	3	4
	EC1Numerical Methods/Applied Mathematics		
Part-IV	Skill Enhancement Course SEC-1	2	2
	Office Automation / Web Designing		
	Foundation Course FC Fundamentals of Information Technology	2	2
		23	30

Semester-II

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	Core Courses 2 (CC3, CC4)	5	5
	CC3 Artificial Intelligence	3	3
	CC4-1 Prolog Lab	2	2
	CC4-2 Multimedia Lab	3	4
	Elective Course 1 (Generic Discipline Specific)	3	4
	EC2Optimization Techniques / Trends in Computing		
Part-IV	Skill Enhancement Course -SEC-2	2	2
	Problem Solving Techniques / Quantitative Aptitude		
	Skill Enhancement Course -SEC-3 (Discipline Specific / Generic)	2	2
	Software Testing/ Design and Analysis of Algorithms		
		23	30

FIRST YEAR – SEMESTER – I
CC1: CORE COURSE – I: JAVAPROGRAMMING

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	5	0	0	I	5	5	25	75	100
Learning Objectives									
LO 1	To provide knowledge on fundamentals of object-oriented programming								
LO 2	to have the ability to use the SDK environment to create, debug and run servlet programs								
Prerequisites: Basic knowledge about programming concepts									
Unit	Contents							No. of Hours	
I	Fundamentals of Object-Oriented Programming: Introduction – Object Oriented Paradigm – Concepts of Object-Oriented Programming – Benefits of OOP – Evolution: Java History- Java Features- Differs from C and C++- Overview of Java Language: Java Program- Structure – Tokens – Java Statements – Java Virtual Machine – Command Line Arguments							15	
II	Constants, Variables and Data Types – Operators and Expressions – Decision making and Branching – Looping – Arrays - Strings – Collection Interfaces and classes							15	
II	Classes objects and methods: Introduction – Defining a class – Method Declaration – Constructors - Method Overloading – Static Members – Nesting of methods – Inheritance – Overriding – Final variables and methods – Abstract methods and classes							15	
I	Multiple Inheritance: Defining Interfaces – Extending Interfaces – Implementing Interfaces – Packages: Creating Packages – Accessing Packages – Using a Package – Managing Errors and Exceptions- Multithreaded Programming							15	
V	Layout Managers -JDBC – Java Servlet: - Servlet Environment Role – Servlet API –Servlet Life Cycle –Servlet Context–HTTP Support– HTML to Servlet Communication							15	
TOTAL							75		
CO	Course Outcomes								
CO 1	Outline the basic terminologies of OOP, programming language techniques, JDBC and Internet programming concepts								
CO 2	Solve problems using basic constructs, mechanisms, techniques and technologies of Java								

CO 3	Analyse and explain the behavior of simple programs involving different techniques such as Inheritance, Packages, Interfaces, Exception Handling and Thread and technologies such as JDBC and Servlets
CO 4	Assess various problem-solving strategies involved in Java to develop a high-level application.
CO 5	Design GUI based JDBC applications and able to develop Servlets using suitable OOP concepts and techniques
Textbooks	
➤	E Balagurusamy(2010), “Programming with Java”, Tata McGraw Hill Edition India Private Ltd, 4th Edition
➤	C Xavier,”Java Programming – A Practical Approach”, Tata McGraw Hill Edition Private Ltd
Reference Books	
1.	P.Naughton and H.Schildt(1999), “Java 2 The Complete Reference”, TMH, 3rd Edition
2.	Jaison Hunder & William Crawford(2002),”Java Servlet Programming”, O’Reilly
3.	Jim Keogh (2002), “J2EE: The Complete Reference”, Tata McGraw Hill Edition.
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	http://javabeginnerstutorial.com/core-java/
2.	http://www.tutorialspoint.com/java/
3.	http://beginnersbook.com/java-tutorial-for-beginners-with-examples/
4.	http://www.homeandlearn.co.uk/java/java.html
5.	http://www.journaldev.com/1877/servlet-tutorial-java (Unit V: Servlet API)

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
Weightage of course contributed to each PSO	12	14	11	11	10	10

CC 2 1 Core Course 2 1 Practical

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
CC8	Java Programming Practical	Core	-	-	3	-	3	4	25	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 know about Event Handling .										
LO4	To enable the students to use String Concepts.										
LO5	To equip the student with programming knowledge in to create GUI using AWT controls.										
EXCERCISE	Details										
1	Write a Java program that prompts the user for an integer and then prints out all the prime numbers up to that Integer										
2	Write a Java program to multiply two given matrices.										
3	Write a Java program that displays the number of characters, lines and words in a text										
4	Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.										
5	Write a program to do String Manipulation using CharacterArray and perform the following string operations: a. String length b. Finding a character at a particular position c. Concatenating two strings										
6	Write a program to perform the following string operations using String class: a. String Concatenation b. Search a substring c. To extract substring from given string										
7	Write a program to perform string operations using String Buffer class: a. Length of a string b. Reverse a string										

	c. Delete a substring from the given string	
8	Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.	
9	Write a threading program which uses the same method asynchronously to print the numbers 1to10 using Thread1 and to print 90 to100 using Thread2.	
10	Write a program to demonstrate the use of following exceptions. a. Arithmetic Exception b. Number Format Exception c. ArrayIndexOutOfBoundsException d. NegativeArraySizeException	
11	Write a Java program that reads on file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes	
12	Write a program to accept a text and change its size and font. Include bold italic options. Use frames and controls.	60
13	Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. (Use adapter classes).	
14	Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.	
15	Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “stop” or “ready” or “go” should appear above the buttons in a selected color. Initially there is no message shown.	
	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	
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

CC 2 2 Core Course 2 2 Practical PHP SCRIPTING – PRACTICAL

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	2	1	2	2	25	75	100
Learning Objectives									
LO1	To enable the student to understand, analyze and build dynamic web pages using PHP with MySQL database								
	Contents								No. of Hours
	Introduction to PHP: Embedding PHP in Web Pages Exercises: 1. Working with Forms.								5
	Exercises: 2. String Manipulations 3. Functions 4. Sorting								10
	Exercises: 5. Classes and Objects 6. Cookies and Sessions 7. Graphics								10
	Working with MySQL Database: Select data from a single table – Select data from multiple tables- Performing DML operations Exercises: 8. Working with multiple tables								5
TOTAL								30	
CO	Course Outcomes								
CO1	Demonstrates simple programs using PHP								
CO2	Apply the interface setup, styles & themes for the given application								
CO3	Analyze the problem and add necessary user interface components, multimedia components and web data source into the application								
CO4	Evaluate the results by implementing the correct techniques on the web form								
CO5	Construct web applications with the facilitated components in PHP								
Textbooks									
➤	Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, “Programming PHP”, O’Reilly Publications, Third Edition								

➤	Joel Murach, Ray Harris (2010), “PHP and MySQL”, Shroff Publishers & Distributors
Reference Books	
1.	W.Jason Gilmore(2010), “BeginningPHP&MySql”,Apress
2.	LarryUllman (2008), “PHP6 and MySQL5”, Pearson Education
3.	John Coggeshall(2006), “PHP5”,Pearson Education
4.	MichaleC.Glass(2004),“BeginningPHP,Apache, MySQLWebDevelopment”,Wiley DreamTechPress
5.	Robin Nixon (2013),“LearningPHP,MySQL, JavaScript &CSS”, O‘Reilly, 2 nd Edition
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	http://www.w3schools.com/jquery/
2.	http://www.ccc.commnet.edu/faculty/sfreeman/cst%20250/jqueryNotes.pdf
3.	http://www.w3schools.com/php/
4.	http://www.tutorialspoint.com/php/
5.	http://www.tutorialspoint.com/mysql/

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	2	2	3
CO3	3	2	3	2	2	3
CO4	3	2	2	2	2	3
CO5	3	2	2	3	2	2
Weightage ofcoursecontributedtoeachPSO	15	11	11	12	11	13

EC1: Elective Course 1 A NUMERICAL METHODS

L T P C
4 0 0 3

COURSE OBJECTIVE:

1. To introduce the concept of solving equations using different methods
2. To understand the use of Assignment and Transportation problems

Unit I:

Curve Fitting: Introduction, Method of Least squares, Curve Fitting, Fitting a Straight Line

Unit II:

Solution of Algebraic and Transcendental Equations: Bisection method, Regula Falsi method, Newton Raphson Method

Unit III:

Solution of Simultaneous Linear Equations: Solution of Simultaneous Linear Equations: Gauss Elimination method, Gauss-Jordan method, Gauss Seidel Method, Jacobi's method

Unit IV:

Numerical Differentiation & Integration: Differentiation: Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference (First Order Differentiation only)

Integration: Using Trapezoidal rule, Simpson's 1/3 & Simpson's 3/8 rules

Unit V:

Solution of Ordinary Differential Equations: Runge-Kutta 2nd Order and 4th Order methods, Predictor-Corrector Methods: Milne and Adam's methods.

COURSE OUTCOME:

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

1. Obtain numerical solutions of algebraic and transcendental equations
2. Solve system of linear equations numerically using direct and iterative methods
3. Solve ordinary differential equations
4. Compute integration using Simpson's & Trapezoidal Rule
5. Apply numerical methods in real life problems

CO - PO - PSO Mapping

NUMERICAL METHODS											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO 1	S	S	S	M	S	S	S	M	S	S	K - 2
CO 2	S	S	M	S	S	S	S	S	S	S	K - 6
CO 3	S	S	M	S	S	S	S	S	S	S	K - 4
CO 4	S	S	M	S	S	S	S	S	S	S	K - 6
CO 5	S	S	M	S	S	S	S	S	S	S	K - 6

Strongly Correlated – S, Moderately Correlated – M, Weekly Correlated - L

TEXT BOOKS

1. B.S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publishers, Fifth Edition, April 1999.
2. M.K. Venkataraman, "Numerical Methods in Science & Engineering", National Publishing Co., 2005'

EC1: Elective Course 1 B APPLIED MATHEMATICS**L T P C**
4 0 0 3

UNIT I: Linear Algebra: Matrix, Representation, Examples of matrix Data, Vectors, examples, Representation, Matrix Addition, Scalar Multiplication, Matrix Multiplication properties, Matrix Vector Multiplication, Matrix Multiplication, Inverse and Transpose.

Unit II: Applications of Matrix operations on Real Time Data, Parallel Matrix Multiplication, Dimensionality Reduction by Principal Component Analysis and Eigen Values, Eigen Vectors.

UNIT III Basic operations of Octave: Installation of Octave, Logical & Arithmetic Operations, Assignment of Different Variables, Assigning Matrices, Vector Representation, Histogram of matrices, Diagonal Matrices.

UNIT V: Data Visualization and Processing using Octave: Finding the size of a Matrix, Loading Data into Octave, Viewing the Workspace of Octave, Accessing the elements of Matrix, Arithmetic operations on matrices- Addition, Multiplication, log, exponentiation, Transpose, Maximum and Minimum Value of a Matrix

Unit V: Control Statements in Octave, Visualizing Data in Octave-Plotting Data, giving labels, axes and titles, Victimization, Vector implementation, Advantages.

Course Outcome:

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

1. Acquire knowledge of processing using octave
2. Statistically analyse data
3. Compute solutions of linear equations and system of equations
4. Understand the basic concepts of Data Visualization
5. Understand matrices

CO - PO - PSO Mapping

APPLIED MATHEMATICS											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO 1	H	H	H	M	H	H	H	M	H	M	K - 1
CO 2	H	H	M	H	H	H	H	H	M	H	K - 4
CO 3	M	H	M	H	H	H	H	M	H	H	K - 5
CO 4	H	M	M	H	H	H	M	H	H	H	K - 3
CO 5	H	H	M	H	H	H	H	H	H	H	K - 5

Strongly Correlated – H, Moderately Correlated – M, Weekly Correlated - L

Books:

1. Jason Lachniet, "Introduction to GNU Octave"

2. Lectures of Professor Dr. Andrew Ng, Stanford University, Coursera.
3. Gene H. Golub, Charles F. Van Loan, "Matrix Computations", John Hopkins University Press.
4. <https://skymind.ai/wiki/eigenvector>
5. Randolph H. Reiss, B.S, "Eigen Values and Eigen Vectors in Data dimension Reduction for Regression", San Marcos, Texas.
6. Gilbert Strang, "Linear Algebra and its Applications", Thomson Learning Inc., 4th Edition.
7. <https://www.cs.utah.edu/~jeffp/M4D/M4D-v0.4.pdf>

SEC 1: Skill Enhancement Course 1A

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
SEC1	OFFICE AUTOMATION		2	Y	-	-	2	2	25	75	100
Course Objective											
C1		Understand the basics of computer systems and its components.									
C2		Understand and apply the basic concepts of a word processing package.									
C3		Understand and apply the basic concepts of electronic spreadsheet software.									
C4		Understand and apply the basic concepts of database management system.									
C5		Understand and create a presentation using PowerPoint tool.									
UNIT	Details										No. of 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.										6
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.										6
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.										6
IV	Database Concepts: The concept of data base management system; Data field, records, and files, Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applications in query language (MS–Access).										6
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.										6
Total										30	
Course Outcomes								Programme Outcomes			
CO	On completion of this course, students will										
1	Possess the knowledge on the basics of computers										PO1,PO2,PO3,PO6
2	Gain knowledge on Creating Documents, spreadsheet and presentation.										PO1,PO2,PO3,PO6

3		Learn the concepts of Database and implement the Query in Database.	PO3,PO5
4		Demonstrate the understanding of different automation tools.	PO3,PO4,PO5
5		Utilize the automation tools for documentation, calculation and presentation purpose.	PO4,PO6
Text Book			
1		Peter Norton, "Introduction to Computers" –Tata Mc Graw-Hill.	
Reference Books			
1.		Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, "Microsoft 2003", Tata McGrawHill.	
Web Resources			
1.		https://www.udemy.com/course/office-automation-certificate-course/	
2.		https://www.javatpoint.com/automation-tools	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	M	S	M			M
CO 2	S	M	S			M
CO 3		S	S		M	
CO 4			S	L	M	
CO 5				M		S

S-Strong M-Medium L-Low

SEC 1: Skill Enhancement Course 1 B

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	WEB DESIGNING		Y	-	-	-	2	2	25	75	100
Course Objective											
C1	Understand the basics of HTML and its components										
C2	To study about the Graphics in HTML										
C3	Understand and apply the concepts of XML and DHTML										
C4	Understand the concept of JavaScript										
C5	To identify and understand the goals and objectives of the Ajax										
UNIT	Details							No. of Hours	Course Objective		
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.							6	C1		
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.							6	C2		
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).							6	C3		
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,							6	C4		
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.							6	C5		
Total								60			
Course Outcomes							Programme Outcome				
CO	On completion of this course, students will										

1	Develop working knowledge of HTML	PO1, PO3, PO6
2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
4	Ability to develop a java script	PO1, PO2, PO3
5	An ability to develop web application using Ajax.	P02, PO6
Text Book		
1	Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole&AtulKahate, “Web Technologies”, 2002, 2nd Edition.	
Reference Books		
1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, “Mastering HTML, CSS &Javascript Web Publishing”, 2016.	
2.	DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.	
Web Resources		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	https://www.geeksforgeeks.org	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S		M			L		M
CO 2	S	M	L			M		
CO 3			S		M			
CO 4	S	M	M				L	
CO 5		M				L	M	

S-Strong M-Medium L-Low

FC1: Foundation Course 1

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	FUNDAMENTALS OF INFORMATION TECHNOLOGY		2	-	-	1	2	25	75	100
Learning Objectives										
LO1	Understand basic concepts and terminology of information technology.									
LO2	Have a basic understanding of personal computers and their operation									
LO3	Be able to identify data storage and its usage									
LO4	Get great knowledge of software and its functionalities									
LO5	Understand about operating system and their uses									
UNIT	Contents								No. Of. Hours	
I	Introduction to Computers: Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer								6	
II	Basic Computer Organization: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.								6	
III	Storage Fundamentals: Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives								6	
IV	Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w								6	

V	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of computer, Construct the structure of the required things in computer, learn how to use it.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop organizational structure using for the devices present currently under input or output unit.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of storing data in computer using two header namely RAM and ROM with different types of ROM with advancement in storage basis.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with different software, Write program in the software and applications of software.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of Operating system in information technology which really acts as a interpreter between software and hardware.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Anoop Mathew, S. Kavitha Murugesan (2009), “ Fundamental of Information Technology”, Majestic Books.	
2	Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2 nd Edition.	
3	S. K Bansal, “Fundamental of Information Technology”.	
Reference Books		
1.	Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology”	
2.	GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell	
3.	A Ravichandran , “Fundamentals of Information Technology”, Khanna Book Publishing	
Web Resources		
1.	https://testbook.com/learn/computer-fundamentals	
2.	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html	
3.	https://www.javatpoint.com/computer-fundamentals-tutorial	
4.	https://www.tutorialspoint.com/computer_fundamentals/index.htm	
5.	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf	

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

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

Semester II

CC3 : Core Course 3

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Artificial Intelligence	Core	5	-	-	II	5	5	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: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree										15
II	<i>Search Algorithms : Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search</i>										15
III	<i>Probabilistic Reasoning : Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.</i>										15
IV	<i>Reinforcement Learning : Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning</i>										15
V	<i>Prolog Programming: Introduction to Prolog: Syntax and Numeric Function, Basic List Manipulation Functions in Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays</i>										15
Total										75	
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 Reinforcement learning Techniques.	PO3, PO4
Text Book		
1	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Prentice Hall.	
2	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill	
3	Carl Townsend, “Introduction to Prolog Programming”	
4	Ivan Bratko, “PROLOG Programming for Artificial Intelligence”, Addison-Wesley, 2 nd Edition.	
5	Klocksins and Mellish, “Programming with PROLOG”	
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	
3.	https://www.toolify.ai/?gclid=CjwKCAjwvdajBhBEEiwAeMh1U6tIqU1LXIRFbcghLMZVwICm_4PkIRcDRE-VYq_wTDcuaQeq_bCHnhoCcm4QAvD_BwE	

Mapping with Programme Outcomes:

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
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

CC 4 1 Core Course 41 - Core Practical 3

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	PROLOG Practical	Core Practical		-	3	-	3	3	25	75	100
	<i>Course Outcome:</i>										
	<ol style="list-style-type: none"> 1. Think logical solution to problems 2. Understand and solve complex problems 3. Select an appropriate algorithm for the problem 4. Evolve as a competent programmer capable of designing algorithms 5. Analyze algorithms 										
	List of programs										
	<ol style="list-style-type: none"> 1. Write Prolog program to implement A* algorithm. 2. Write Prolog program to implement MinMax search 3. Write Prolog program to solve water jug problem 4. Write Prolog program to implement TicTacToe 5. Write Prolog program to implement alpha-beta pruning 6. Write Prolog program to solve 4 Queen problem 										

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S					S		S
CO 2	M	S					S	M
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

Core 4 2 Core Practical 4 : Multimedia Lab

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
SEC4	0	0	2		2	2	25	75	100
Learning Objectives									
LO1	Understands the basics of multimedia								
LO2	Acquire knowledge of image editing and animation techniques.								
LO3	Apply multimedia concepts to real world projects								
Unit	Contents								No. of Hours
I	GIMP's Tools- Taking Advantage of Paths - Working with Layers and masks - Using Channels Exercises: <ol style="list-style-type: none"> 1. Enlarge a Logo using path 2. Create an ink drawing using path 3. Replace Background of image using Channels 								6
II	Manipulating Images: Transforming Images - Using The Image Tools - Adjusting Colors - Working with Text - Painting in Gimp: Creating new brushes - Enhancing Photos - Exploring Filters and Effects. Exercises: <ol style="list-style-type: none"> 1. Design Front Cover for a Book. 2. Create a customized logo 3. Use clone tool to remove text from an image 4. Remove Red eye using Filter. 								6
III	Using GIMP animation package - Managing the Frames of Image Sequence with GAP - Morphing - onion skinning - Creating a Storyboard. Exercises: <ol style="list-style-type: none"> 1. Morphing - Create smooth transitions from one image to another. 2. Create a Story board for your project 								6
IV	Flash: Introduction - Creating and Editing Objects - Color and Text. Animations: Frame- by- frame animation-Motion Tweening- Motion Guides <ol style="list-style-type: none"> 1. Creating Frame-by-frame Animation 2. Create a Motion Tween for Graphic and Text Object 3. Create a Motion guide Layer 								6
V	Shape Tweening - Masking - Interactivity: Adding Script to Buttons - Testing and Publishing. <ol style="list-style-type: none"> 1. Create a Shape Tween for Graphic Object 2. Create a Mask Layer 3. Adding buttons with Action Script 								6
TOTAL									30

CO	Course Outcomes
CO1	Demonstrate understanding and use of multimedia fundamentals
CO2	Implement appropriate techniques required for editing images and designing animated system
CO3	Solve various design and implementation issues materialize on the development of multimedia systems
CO4	Assess different Photo Editing, Video Editing and animation tools and select the appropriate tool based on the requirements
CO5	Design and develop Multimedia Projects
Textbooks	
➤	<ol style="list-style-type: none"> 1. Jason Van Gumster& Robert Shimonski (2010), “GIMP Bible”, Wiley, 2nd edition. 2. Chris Gover, 2010, “Flash CS5: The missing Manual”, 1st Edition, O’ Reilly India.
Reference Books	
1	Juan Manuel Ferreyra (2011), “GIMP 2.6 Cookbook”, PACK publishing Ltd.
2	Robert Reinhard (2003), “Macromedia Flash MX Bible”, Wiley Dreamtech India Pvt Ltd.
NOTE: Latest Edition of Textbooks May be Used	
Web Resources	
1.	https://www.youtube.com/watch?v=T8NIK3Rdolc (Unit IV: Gimp Video Editing)
2.	https://www.youtube.com/watch?v=Jz9WrbELGYA

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	M	S	M			M		L
CO 2	S	M	S			M		
CO 3		S	S		M		L	
CO 4			S	L	M		M	
CO 5				M		S	M	S

	L	T	P	C
EC2: Elective Course 2 A OPTIMIZATION TECHNIQUES	4	0	0	3

Course objectives:

1. To apply various optimization techniques for decision making.
2. To introduce the use of variables for formulating complex mathematical models in management, science and industrial applications

Course Outcome:

- On successful completion of the course, the learners will be able to CO1. Formulate and solve Linear Programming Problems.
 CO2. Analyze the usage of Sequencing Problems.
 CO3. Evaluate Queueing Models.
 CO4. Apply PERT and CPM techniques to find the optimal solution.

UNIT I **12 hours**

INTRODUCTION-LINEAR PROGRAMMING PROBLEM

The Nature and Meaning of OR – Management – Applications of OR – Modeling in OR – General methods for solving OR models – Scope of OR.

Linear Programming Problem: Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – Standard form of LPP – Some important forms of LPP – Simplex Method I.

UNIT II **12 hours**

ASSIGNMENT PROBLEMS

Assignment Problem: Mathematical formulation–Hungarian method–Unbalanced assignment problem – Various types

UNIT III **12 hours**

TRANSPORTATION PROBLEMS

Transportation Model: Mathematical formulation – Matrix form–Methods for finding Initial Basic Feasible solution and Optimal solution – Degeneracy in Transportation Problems – Unbalanced Transportation Problem.

UNIT IV **12 hours**

SEQUENCING PROBLEMS AND QUEUEING MODELS

Sequencing Problems: Assumptions – Solutions to Sequencing Problems: Processing n jobs through 2 machines – Processing n jobs through 3 machines – Processing n jobs on m machines.

Queueing Models: Queueing System – Transient and Steady States–Kendal’s Notation for representing Queueing Models – Various Models in Queueing System – Birth and Death Model.

UNIT V**12 hours****PERT AND CPM TECHNIQUES**

PERT and CPM Techniques: Basic Steps – Network Diagram representation– Rules for drawing Network Diagram – Labeling Fulkerson’s I–J Rule – Time Estimates and Critical Path in Network Analysis – Examples on optimum duration and minimum duration cost – PERT.

CO-PO –PSO Mapping

OPTIMIZATION TECHNIQUES											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO1	S	S	S	M	S	S	S	M	S	S	K-2
CO2	S	S	M	S	S	S	S	S	S	S	K-1
CO3	S	S	M	S	S	S	S	S	S	S	K-3
CO4	S	S	M	S	S	S	S	S	S	S	K-5
CO5	S	S	M	S	S	S	S	S	S	S	K-6

Strongly Correlated–S, Moderately Correlated–M, Weekly Correlated-L

TEXT BOOK

S.D.Sharma, “Operations Research”, Tenth Edition, Pearson, 2017.

REFERENCE BOOKS

1. Hamdy A Taha, “Operations Research”, Ninth Edition, 2016.
2. V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, “Resource Management Techniques”, Ninth Edition, A. R.Publications, 2015.

EC2: Elective Course 2 B

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Trends in Computing	Elective	-	Y	-	-	3	4	25	75	100
Course Objective											
C1	Learning current trends in various computer science and information technology fields.										
C2	Learning various fields of Cloud computing, Green computing ,the Edge and Fog computing technology.										
C3	To learn about Architecture and Application design of Cloud, Edge & fog computing.										
C4	To know computingandtoimprove security services of computing technologies.										
C5	To learn the various Case Studies in Cloud, Edge & fog Computing.										
UNIT	Details										No. of Hours
I	Era of Cloud Computing: Introduction – Components of Cloud Computing – Cloud Types: Private, Public and Hybrid clouds – Limitations of the Cloud - Virtualization: Structure and Mechanisms.										12
II	Cloud computing Services: Software as a Service(SaaS) – Platform as a Service(PaaS)- Infrastructure as a Service(IaaS)-Database as a Service(DBaaS)- Recent Trends in cloud computing and Standards- Data Security in Cloud – Risks and Challenges with Cloud Data-Security as a Service.										12
III	EdgeComputing: EdgeComputing and Its Essentials: Introduction-EdgeComputing Architecture- Advantages and Limitations of EdgeComputingSystems- EdgeComputing Interfaces and Devices - EdgeAnalytics: Edge Data Analytics – Potential of EdgeAnalytics – Architecture of EdgeAnalytics – Case study										12
IV	Edge Data storage Security: Edge-Based Attack Detection and Prevention-Edge Computing Use Cases and Case Studies: Edge Computing High- Potential Use Cases. Introductiontogreen computing –Calculatingcarbonfootprint- Choosing Green PC path: A green make over – Buying green										12

	computer- Choosing Earth Friendly peripherals	
V	Fog Computing: Introduction to Fog computing – Architecture - Characteristics - Fog Computing Services – Fog Resource Estimation and Its Challenges-Fog computing on 5G networks – Fog computing Use cases and Case studies.	12
	Total	60
Course Outcomes		Program me Outcome
CO	On completion of this course, students will	
1	Outline the concepts, applications, benefits and limitations of various computing paradigms.	PO1
2	Classify the computing technologies based on its architecture and infrastructure and identify its strategies.	PO1, PO2
3	Examine various cloud services, Security threat exposure within a cloud computing infrastructure.	PO4, PO6
4	Asses the problems and solutions involved in various stages of different computing environments.	PO4, PO5, PO6
5	Discuss the importance of cloud, edge and Fog technology and implement innovative ideas and practices for regulating green IT.	PO3
Text Book		
1	Kailas Jayaswal, Jagannath Kallakurchi, Donald J. Houde, Dr. Devan Shah “ Cloud Computing –Black Book” Edition :2020 (UNIT I & II : CHAPTER 1,2,3,9,11)	
2	K. Anitha Kumari G. Sudha Sadasivam D. Dharani M. Niranjanamurthy, “EDGE COMPUTING Fundamentals, Advances and Applications”, First Edition 2022, CRC Press. (UNIT III & IV : CHAPTER 1, 2 , 3, 4,5,6)	
3	Woody Leonhard and Katherine Murray (2009) ,Green Home Computing for Dummies, Willey Publishing Inc. (UNIT IV : CHAPTER 2 ,5,6,7)	
4	Evangelos Markakis, George Mastorakis, Constandinos X. Mavromoutakis and Evangelos pallis “Cloud and Fog computing in 5G mobile Networks” ,First edition 2017. (UNIT V: CHAPTER 2)	
Reference Books		
1.	Raj Kumar Buyya, Christian Vecchiola, S. Thamarai Selvi, (2013), Mastering Cloud Computing, McGraw Hill Education.	
2.	Michael Miller, (2009), Cloud Computing, Pearson Education.	

3.	Shijun Liu BedirTekinerdoganMikio Aoyama Liang-Jie Zhang” Edge Computing – EDGE “ 2018.
4.	FlavioBonomi, Rodolfo Milito, Jiang Zhu, SateeshAddepalli, —Fog Computing and Its Role in the Internet of Thingsl, MCC’12, August 17, 2012, Helsinki, Finland. Copyright 2012.
5	Amir M. Rahmani · Pasi LiljebergJürgo-Sören Preden “Fog Computing in the Internet of Things”Springer,2018. (UNIT V: PART/CHAPTER (1.4,2.5)
Web Resources	
1.	https://static.googleusercontent.com/media/www.google.com/en//green/pdfs/google-green-computing.pdf (CaseStudy)
2.	http://whatiscloud.com/basic concepts and terminology/cloud
3.	http://www.computerweekly.com/guides/Using-green-computing-for-improving-energy-efficiency

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	S	S						
CO 3				S		S		
CO 4				S	S	S		
CO 5			S					S

S-Strong M-Medium L-Low

SEC 2: Skill Enhancement Course 2 A

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	PROBLEM SOLVING TECHNIQUES		Y	-	-	-	2	2	25	75	100
Course Objective											
C1	Understand the systematic approach to problem solving.										
C2	Know the approach and algorithms to solve specific fundamental problems.										
C3	Understand the efficient approach to solve specific factoring-related problems.										
C4	Understand the efficient array-related techniques to solve specific problems.										
C5	Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.										
UNIT	Details									No. of Hours	
I	Introduction: Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.									6	
II	Fundamental Algorithms: Exchanging the values of two variables – Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.									6	
III	Factoring Methods: Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the n th Fibonacci number.									6	
IV	Array Techniques: Array order reversal – Array counting or histogramming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the k^{th} smallest element –									6	

	Longest monotone subsequence.	
V	Text Processing and Pattern Searching: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. Recursive algorithms: Towers of Hanoi – Permutation generation.	6
	Total	30
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Understand the logic of problem and analyses implementation of algorithm and TopDown approach and concept of Recursion	PO1,PO6
2	Able to understand the Sequence of Numbers and Series Fibonacci, Reversing ,Base Conversion.	PO2
3	Able to do Algebraic operations	PO2,PO4
4	Coverage of Arrays and its Logics	PO6,PO8
5	Text Processing and Pattern Searching Approach	PO7
Text Book		
1	R. G. Dromey, <i>How to Solve it by Computer</i> , Pearson India, 2007	
Reference Books		
1.	George Polya, Jeremy Kilpatrick, <i>The Stanford Mathematics Problem Book: With Hints and Solutions</i> , Dover Publications, 2009 (Kindle Edition 2013).	
2.	Greg W. Scragg, <i>Problem Solving with Computers</i> , Jones & Bartlett 1st edition, 1996.	
Web Resources		
1.	https://www.studytonight.com/	
2.	https://www.w3schools.com/	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	M					S		
CO 2		M						
CO 3		S		L				
CO 4						S		M
CO 5							M	

S-Strong M-Medium L-Low

SEC 2: Skill Enhancement Course 2B

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Quantitative Aptitude		Y	-	-	-	2	2	25	75	100
Course Objective											
C1	To understand the basic concepts of numbers										
C2	Understand and apply the concept of percentage, profit & loss										
C3	To study the basic concepts of time and work, interests										
C4	To learn the concepts of permutation, probability, discounts										
C5	To study about the concepts of data representation, graphs										
UNIT	Details							No. of Hours	Course Objective		
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification- Square root and cube roots - Average-problems on Numbers.							6	CO1		
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule.							6	CO2		
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surface area -races and Games of skill.							6	CO3		
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Odd man out & Series.							6	CO4		
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs-Pie charts-Line graphs.							6	CO5		
	Total							60			
Course Outcomes								Programme Outcome			
CO	On completion of this course, students will										
1	understand the concepts, application and the problems of numbers							PO1			

2	To have basic knowledge and understanding about percentage, profit & loss related processing	PO1, PO2
3	To understand the concepts of time and work	PO4, PO6
4	Speaks about the concepts of probability, discount	PO4, PO5, PO6
5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3
Text Book		
1	“Quantitative Aptitude”, R.S.AGGARWAL, S. Chand & Company Ltd.,	
Web Resources		
1.	https://www.javatpoint.com/aptitude/quantitative	
2.	https://www.toppr.com/guides/quantitative-aptitude/	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

SEC 3: Skill Enhancement Course 3 A

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	Software Testing		Y	-	-	II	2	2	25	75	100
Course Objective											
C1	To study fundamental concepts in software testing										
C2	To discuss various software testing issues and solutions in software unit test, integration and system testing.										
C3	To study the basic concept of Data flow testing and Domain testing.										
C4	To Acquire knowledge on path products and path expressions.										
C5	To learn about Logic based testing and decision tables										
UNIT	Details						No. of Hours	Course Objective			
I	Introduction: Purpose–Productivity and Quality in Software–Testing Vs Debugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.						6	C1			
II	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction Flow Testing Techniques.						6	C2			
III	Data Flow Testing Strategies - Domain Testing: Domains and Paths – Domains and Interface Testing.						6	C3			
IV	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions, Syntax Testing–Formats–Test Cases						6	C4			
V	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, State Testing.						6	C5			
	Total						30				
Course Outcomes							Program Outcomes				
CO	On completion of this course, students will										
1	Students learn to apply software testing knowledge and engineering methods						PO1				
2	Have an ability to identify the needs of software test automation, and define and develop a test tool to						PO1, PO2				

	support test automation.	
3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3
Text Book		
1	B.Beizer,“SoftwareTestingTechniques”,IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,“SoftwareTestingTools”,DreamTech.India,NewDelhi,2005	
Reference Books		
1.	I.Burnstein,2003,“PracticalSoftwareTesting”,SpringerInternationalEdn.	
2.	E. Kit, 1995, “Software Testing in the Real World: Improving the Process”, PearsonEducation,Delhi.	
3.	R. Rajani,andP.P.Oak,2004,“SoftwareTesting”,TataMcgrawHill,New Delhi.	
Web Resources		
1.	https://www.javatpoint.com/software-testing-tutorial	
2.	https://www.guru99.com/software-testing.html	

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong M-Medium L-Low

SEC 3: Skill Enhancement Course 3B

L T P C
2 0 0 2

Design and Analysis of algorithm

Course Objectives

1. To understand various algorithm design techniques
2. Provides a general insight into the dynamic programming approach.
3. To design algorithms for discrete and combinatorial optimization problems.

Course Outcomes

1. gain experience with space and time complexity
2. understand the concepts of divide and conquer
3. understand the concepts of greedy method
4. understand the concepts of multistage graph
5. understand the concepts of backtracking

Unit-1: ALGORITHM ANALYSIS

Hours: 5

Elementary Data Structures: Stack – Queues – Trees – Priority Queue – Graphs – What is an Algorithm? – Algorithm Specification – Performance Analysis: Space Complexity – Time Complexity – Asymptotic Notation – Randomized Algorithms.

Unit-2: DIVIDE AND CONQUER

Hours: 5G

General Method – Binary Search – Recurrence Equation for Divide and Conquer – Finding the Maximum and Minimum – Merge Sort – Quick Sort – Randomized Sorting Algorithm – Selection Sort – Strassen's Matrix Multiplications.

Unit-3: THE GREEDY METHOD

Hours: 7Th

General Method – Container Loading – Knapsack Problem – Tree Vertex Splitting – Job Sequencing with Deadlines – Minimum Cost Spanning Trees – Prim's Algorithm – Kruskal's Algorithm – Optimal Storage on Tapes – Optimal Merge Pattern – Single Source Shortest Paths.

Unit-4: DYNAMIC PROGRAMMING, TRAVERSAL & SEARCHING

Hours: 7

The General Method – Multistage Graphs – All Pair Shortest Path – Reliability Design – The Traveling Salesperson Problem. Techniques for Binary Trees – Techniques for Graphs – BFS – DFS.

Unit-5: BACKTRACKING & BRANCH AND BOUND

Hours: 6

The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Branch and Bound: General Method – LC Branch and Bound – FIFO Branch and Bound.

Textbooks:

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Galgotia Publications, Second Edition 2015.
2. "Introduction to Algorithms", Cormen T.H., Leiserson C.E. and Rivest R.L., PHI Publications, Third Edition, 1998.

Reference Books:

1. "IntroductiontotheDesignandAnalysisofAlgorithms",AnanyLevitin,PearsonEducation,2ndEdition.
2. "IntroductiontoAlgorithms"ThomasHCormen,CharlesELeiserson,RonaldLRivestandCliffordStein,PrenticeHallofIndia,NewDelhi,SecondEdition,2007.
3. "ComputerAlgorithms–IntroductiontoDesign&Analysis"SaraBaaseandAllenVanGelder,PearsonEducationNewDelhi,ThirdEdition,2000.

MappingwithProgrammeOutcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	M	M	S	M	M	S	M	S	S
CO4	S	S	M	S	M	M	M	S	S	S
CO5	S	S	M	M	M	S	M	S	S	S

S– Strong, M –Medium,L–Low