



Prof. Dr. M. Karunanithi,
B.Pharm., M.S., Ph.D., D.Litt.,
Chairman & Secretary

VIVEKANANDHA

COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(Autonomous)

[AN ISO 9001 : 2015 CERTIFIED INSTITUTION]
Affiliated to Periyar University, Approved by AICTE
Re-Accredited with 'A+' Grade by NAAC,
Recognized under section 2(f) & 12(B) of UGC Act, 1956
ELAYAMPALAYAM, TIRUCHENGODE (Tk.), NAMAKKAL (Dt.)



PG & RESEARCH DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS

B.Sc., CS (AI & ML)

Bachelor of Science in Computer Science
(Artificial Intelligence & Machine Learning)

**FOR CANDIDATES ADMITTED FROM 2023 – 2024
ONWARDS UNDER AUTONOMOUS – OBE PATTERN**

VIVEKANANDHA EDUCATIONAL INSTITUTIONS
Elayampalayam, Tiruchengode (Tk), Namakkal (Dt).,

**VIVEKANANDHA COLLEGE OF ARTS AND SCIENCES FOR WOMEN
(AUTONOMOUS)****B.Sc., CS (AI & ML)
Bachelor of Science in Computer Science
(Artificial Intelligence and Machine Learning)
(Candidates admitted from 2023-2024 onwards)****REGULATIONS****I. SCOPE OF THE PROGRAMME**

The IT boom and the rapid growth in science and technology have opened up new vistas of job opportunities. The college offers Bachelor of Computer Applications which seeks to equip the learners to meet the spiraling demand of the IT industry. It provides special training in computer application of software's. The syllabus has been designed at a level equal to that of professional courses. Focus is also on developing soft skills of the students.

II. SALIENT FEATURES

- ❖ Qualified and Experienced team of faculty members with varied experience in areas of Computer Architecture, Artificial Intelligence, Mobile and Computer Networks, Graphics and Image Processing and Database Management System
- ❖ Motivating of students enhanced with immense expertise, massive technical exposure & structured creative initiatives.
- ❖ Industrial visits to various renowned companies are arranged to give an exposure to the students
- ❖ Students are taught by using Audio Visual aids like OHP's & LCD Projectors and modern E-learning
- ❖ Course is specially designed for a higher level Career Placement
- ❖ Project work is included in the syllabus to enhance conceptual, analytical & deductive skills

III. OBJECTIVES OF THE PROGRAMME

- ❖ To produce a highly qualified professionals impart of both theoretical and practical knowledge in computer systems and its application.
- ❖ To produce fully skilled and trained manpower capable of solving the software & hardware problems, and discovering software solutions related to business organizations.
- ❖ To provide an in-depth knowledge of specific sub-disciplines chosen by the students as areas of special interest in the form of elective courses.
- ❖ The B.Sc., (AI & ML) Program is aimed at providing a platform to the students to enhance their skills in various fields of Computer Science & Information Technology like Hardware, Software development, Networking, Database Management & IT enabled services and to facilitate students to interact with IT professionals, Industry Partners & Academicians from IT and related areas.
- ❖ The courses is designed to develop computer professionals versatile is use of computers in almost all field of computer application. The main emphasis of the course are an applied computer use in various fields.

IV. ELIGIBILITY FOR ADMISSION

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

V. DURATION OF THE PROGRAMME

- ❖ The course shall extend over a period of three academic years consisting of six semesters. Each academic year will be divided into two semesters. The First semester will consist of the period from July to November and the Second semester from December to March.
- ❖ The subjects of the study shall be in accordance with the syllabus prescribed from time to time by the Board of Studies of Vivekanandha College of Arts and Sciences for Women with the approval of Periyar University, Salem.
- ❖ Each subject will have four to six hours of lecture per week apart from practical training at the end of each semester.

VI. CONTINUOUS INTERNAL ASSESSMENT (CIA)

The performance of the students will be assessed continuously and the Internal

ASSESSMENT MARKS FOR THEORY PAPERS WILL BE AS UNDER:

1	CIA Test I & II (2.5 from each Test)	-	05
2	Model Exam	-	10
3	Assignment	-	05
4	Attendance	-	05
		Total	25

ASSESSMENT MARKS FOR PRACTICAL PAPERS WILL BE AS UNDER:

1	Model Exam	-	20
2	Observation Note	-	10
3	Attendance	-	10
		Total	40

PASSING MINIMUM - EXTERNAL

Theory	In the End Semester Examinations, the passing minimum shall be 40% out of 75 Marks. (30 Marks)
Practical / Mini Project	In the End Semester Examinations, the passing minimum shall be 40% out of 60 Marks. (24 Marks)

VII. ELIGIBILITY FOR EXAMINATION

A candidate will be permitted to appear for the University Examination only on learning 75% of attendance and only when her conduct has been satisfactory. It shall be open to grant exemption to a candidate for valid reasons subject to conditions prescribed.

DISTRIBUTION OF MARKS FOR ATTENDANCE

Attendance Percentage	Marks	
	Theory	Practical
75-80	1	2
81-85	2	4
86-90	3	6
91-95	4	8
96-100	5	10

VIII. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Successful candidates passing the Examination of Core Courses (Main & Allied Subjects) & Securing Marks.

- a) 75 % and above shall be declared to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at first appearance itself.
- b) 60% and above but below 75 % shall be declared to have passed the Examinations in First Class.
- c) 50% & above but below 60% shall be declared to have passed the examinations in Second Class.
- d) All the remaining successful candidates shall be declared to have passed the examinations in Third Class.
- e) Candidates who pass all the examinations prescribed for the course at the First appearance itself and within a period of Three Consecutive Academic years from the year of admission only will be eligible for University Rank.

IX. ELIGIBILITY FOR AWARD OF THE DEGREE

A candidate shall be eligible for the award of the Degree only if she has undergone the above Degree for a period of not less than Three Academic years comprising of six semesters and passed the Examinations prescribed and fulfilled such conditions has have been prescribed therefore.

X. PROCEDURE IN THE EVENT OF FAILURE

If a candidate fails in a particular subject, she may reappear for the university examination in the concerned subject in subsequent semesters and shall pass the examination.

XI. COMMENCEMENT OF THESE REGULATIONS

These regulations shall take effect from the academic year 2021-22 (i.e.,) for the students who are to be admitted to the First year of the course during the Academic year 2021-22 and thereafter.

XII. TRANSITORY PROVISIONS

Candidates who were admitted to the UG course of study before 2021-2022 shall be permitted to appear for the examinations under those regulations for the period of Three years i.e., upto and inclusive of the Examinations of 2023-2024. Thereafter, they will be permitted to appear for the examinations only under the regulations then in force.

EVALUATION OF EXTERNAL EXAMINATIONS (EE)

<u>QUESTION PAPER PATTERN – THEORY</u>	
Time duration: 3 Hours	
Max. Marks: 75	
PART- A: (10 x 1 = 10)	Answer all the Questions Four Questions from each Unit
PART- B: (5 x 7 = 35)	Answer all the questions One Question from each Unit (Either or Type)
PART- C: (3 x 10 = 30)	Answer any THREE of the questions One Question from each Unit (3 Out of 5)
IN THE END SEMESTER EXAMINATIONS, THE PASSING MINIMUM SHALL BE 40% OUT OF 75 MARKS. (30 MARKS)	

<u>QUESTION PAPER PATTERN – PRACTICAL</u>	
Time duration: 3 Hours	
Max. Marks: 60	
1. One compulsory question from the given list of objectives	30 Marks
2. One either/or type question from the given list of objectives	30 Marks
IN THE END SEMESTER EXAMINATIONS, THE PASSING MINIMUM SHALL BE 40% OUT OF 60 MARKS. (24 MARKS)	

B.SC., CS (AI & ML)
(BACHELOR OF SCIENCE IN COMPUTER SCIENCE
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

CURRICULUM FOR ACADEMIC YEAR 2023 – 2024

Course Pattern and Scheme of Examinations under Autonomous, OBE Pattern, TANSCH

FOR THE CANDIDATES ADMITTED FROM THE YEAR 2023 – 2024

SEMESTER: I & II

SEM	PART	COURSE CODE	COURSE TITLE	Hrs	CRE DIT	MARKS		
						CIA	EE	TOT
I	I	23U1LT01 23U1LH01	Tamil-I Hindi-I	6	3	25	75	100
	II	23U1LE01	Communicative English – I	6	3	25	75	100
	III	23U1AIC01	Programming in C	5	5	25	75	100
	III	23U1AICP01	Programming in C Lab	4	4	40	60	100
	III	23U1IMAGE03	Allied: I Discrete Mathematics	5	3	25	75	100
	III	23U1ENAC01	Soft Skill for Effective Communication – I	2	2	25	75	100
	IV	23U1VE01	Value Education	2	2	25	75	100
	Total				30	22	175	525
II	I	23U2LT02 23U2LH02	Tamil-II Hindi-II	5	3	25	75	100
	II	23U2LE02	Communicative English – II	5	3	25	75	100
	III	23U2AIC02	Java Programming	5	5	25	75	100
	III	23U2AICP02	Java Programming Lab	4	3	40	60	100
	III	23U2AIGE02	Allied: II Operation Research	5	3	25	75	100
	III	23U2ENAC02	Soft Skill for Effective Communication – II	4	3	25	75	100
	IV	23U2EVS01	Environmental Studies	2	2	25	75	100
	Total				30	22	200	600

SEMESTER: III & IV

Sem	Part	Course Code	COURSE TITLE	Hrs	CREDIT	MARKS		
						CIA	EE	TOT
III	I	23U3LT03 23U3LH03	Language – III	6	3	25	75	100
	II	23U3LE03	English – III	6	3	25	75	100
	III	23U3AIC03	Tensor Flow	4	4	25	75	100
	III	23U3AICP03	Tensor Flow Lab	4	3	25	75	100
	III	23U3AIGE03	Statistical Methods and Their Applications I	4	3	25	75	100
	III	23U3AIGEP1	Statistics Practical	2	1	0	0	0
	IV	23U3AIS01 Skill Based Subject	Design and Analysis of Algorithms	2	2	25	75	100
	IV	23U3AIN01 Non-Major Elective	Introduction to Information Technology	2	2	25	75	100
	Total				30	21	175	525
IV	I	23U4LT04 23U4LH04	Language – IV	6	3	25	75	100
	II	23U4LE04	English - IV	6	3	25	75	100
	III	23U4AIC04	Advanced Python Programming	4	4	25	75	100
	III	23U4AICP04	Advanced Python Programming Lab	4	4	25	75	100
	III	23U4AIGE04	Statistical Methods and their Applications II	4	3	25	75	100
	III	23U4AIGEP2	Statistics Practical	2	1	25	75	100
	IV	23U4AIS02 Skill Based Subject	Data Communication and Network	2	2	25	75	100
	IV	23U4AIN02 Non-Major Elective	Internet Technology	2	2	25	75	100
	Total				30	22	200	600

SEMESTER: V & VI

SEM	Part	COURSE CODE	COURSE TITLE	Hrs	CREDIT	MARKS		
						CIA	EE	TOT
V	III	23U5AIC05	Principles of Robotics	5	5	25	75	100
	III	23U5AIC06	R Programming	5	5	25	75	100
	III	23U5AIC07	Artificial Intelligence & Knowledge Representation	5	4	25	75	100
	III	23U5AICP05	Robotics Lab	4	3	25	75	100
	III	23U5AICP06	R Programming Lab	4	3	25	75	100
	III	23U5AIC08	Fuzzy Logic and Neural Networks	5	4	25	75	100
	IV	23U5AIS03 Skill Based Subject	Relational Database Management System	2	2	25	75	100
	Total				30	26	175	525
VI	III	23U6AIC09	Machine Learning Techniques	5	4	25	75	100
	III	23U6AIC10	Natural Language Processing	5	4	25	75	100
	III	23U6AICP07	Machine Learning Lab	4	3	25	75	100
	III	23U6AICP08	Natural Language Processing Lab	4	3	25	75	100
	III	23U6AICPR01	Project Work (Group/Individual Project)	4	4	25	75	100
	III	Internal Elective	Computer Organization	3	3	25	75	100
	III	Internal	Operating System	3	3	25	75	100
	IV	23U6AIS04 Skill Based Subject	Ethical Hacking	2	2	25	75	100
	V		Extension Activities	0	1	0	0	0
	Total				30	27	200	600
Grand Total				180	140			

CREDIT POINTS DISTRIBUTIONS

Part	Subject	Papers	Credit	Total Credits	Marks	Total Marks
Part I	Languages	4	4	16	100	400
Part II	Communicative English & English	4	4	16	100	400
Part III	Allied (Odd Semester)	2	3	6	100	200
	Allied (Even Semester)	2	5	10	100	200
	Allied Practical	1	-		100	100
	Electives	3	3	9	100	300
	Core	9	(3-5)	34	100	900
	Core practical	8	(2-3)	21	100	800
	Professional English	2	3	6	100	200
	Compulsory Project (Group/Individual Project)	1	5	5	100	100
Part IV	Environmental Science	1	2	2	100	100
	Soft skill	1	1	1	100	100
	Value Education	1	2	2	100	100
	Lang. & Others /NME	2	2	4	100	200
	Skill Based	4	2	8	100	400
Part V	Extension Activities	1	1	1	100	100
	Total	46		140		4600

B.SC., CS (AI & ML)
BACHELOR OF SCIENCE IN COMPUTER SCIENCE
(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

VISION OF THE DEPARTMENT

To provide high academic goals to the students and make them the world leaders both in educational and research through effective teaching.

MISSION OF THE DEPARTMENT

- ❖ To create, share and apply knowledge in Computer Science including inter disciplinary areas that extends the scope of Computer Science and benefit humanity.
- ❖ To educate students to be successful, ethical and effective problem solvers.
- ❖ To prepare the students to contribute positively to the economic well being of our region and nation.

PROGRAMME OBJECTIVES

1. Students will establish themselves as effective professionals by solving real problems through the use of computer science knowledge and with attention to team work, effective communication, critical thinking and problem solving skills.
2. Students will develop professional skills that prepare them for immediate employment and for life-long learning in advanced areas of computer science and related fields.
3. Students will demonstrate their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.
4. Students will be provided with an educational foundation that prepares them for their excellence.
5. Students will prepares for leadership roles along diverse career paths with encouragement to professional ethics and active participation needed for a successful career.

PROGRAMME EDUCATIONAL OBJECTIVES:

1. To practice their profession with confidence by applying new ideas and technologies in the domain of Artificial Intelligence and Machine Learning for the sustainable growth of Industry and Society.
2. To pursue higher studies for professional growth with superior ethics and character.
3. To engage in research leading to innovations/products or become a successful Entrepreneur.

PROGRAMME OUTCOMES:

1. Apply the knowledge of mathematics and science to the solution of complex engineering problems.
2. Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences.
3. Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Use research-based knowledge and research methods including design of experiments,

analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Create, select, and apply appropriate techniques, resources, and modern tools including prediction and modeling to complex activities with an understanding of the limitations.
6. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.
7. Understand the impact of the solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communicate effectively on complex activities and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PROGRAMME SPECIFIC OUTCOMES:

On Completion of B.Sc. Artificial Intelligence & Machine Learning Programme, graduates will be able to

1. Demonstrate the knowledge of human cognition, Artificial Intelligence, Machine Learning and data engineering for designing intelligent systems.
2. Apply computational knowledge and project development skills to provide innovative solutions.
3. Use tools and techniques to solve problems in AI and ML.

 **SEMESTER – I** 

Semester	I	PROGRAMMING IN C	Credit	4
Code	23U1AIC01		Hours	5

Course Objectives

1. To understand simple algorithms,
2. To understand language constructs
3. To understand and develop programming skills in C.
4. To understand the basic concepts of decision making and looping statements.
5. To understand the concepts of arrays, structures, union, pointers and files.

Course Outcomes

1. After studied unit-1, the student will be able to understand the concepts of Constants, Variables, and Data Types, Operators and Expressions
2. After studied unit-2, the student will be able to understand the concepts of Managing Input and Output Operations, Decision Making and Branching, Decision Making and Looping.
3. After studied unit-3, the student will be able to understand the concepts of Arrays, Character Arrays and Strings, User Defined Functions.
4. After studied unit-4, the student will be able to understand the concepts of Structure and Unions, Pointers, File Management in C.
5. After studied unit-5, the student will be able to understand the concepts of Fundamental Algorithms, Factoring Methods.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

SYLLABUS**Unit-1: OVERVIEW OF C****Teaching Hrs: 12**

History – Importance – Sample Programs – Basic Structure – Programming Style – Executing – **Constants, Variables, and Data Types:** Character Set – C Token – Keyword and Identifiers – Constants – Variables – Data Types – Declaration of Storage Class – Assigning Values to Variables – Defining Symbolic Constants.

Managing Input and Output: Reading, Writing a Character – Formatted Input, Output

Unit-2: OPERATORS AND DECISION MAKING AND BRANCHING**Teaching Hrs: 12**

Operators and Expressions: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special Operators – Arithmetic Expressions, Evaluation of Expressions – Precedence of Arithmetic Operators – Some Computational Problems – Type Conversions in Expressions – Operator Precedence and Associativity – Mathematical Functions. **Decision Making and Branching:** Decision Making with If statement – Simple If Statement – The If...Else Statement – Nesting of If...Else Statements – The Else If Ladder – The Switch Statement- The ?: Operator – The Goto Statement

Unit-3: DECISION MAKING AND LOOPING AND ARRAYS:**Teaching Hrs: 12**

Decision Making and Looping: The while Statement – The do Statement – The for Statement – Jumps in Loops – Concise Test Expressions.

Arrays: One-Dimensional Arrays - Declaration, Initialization of One-Dimensional Arrays – Two-Dimensional Arrays - Initializing Two-Dimensional Arrays – Multi-Dimensional Arrays – Dynamic Arrays.

Character Arrays and Strings: Declaring and Initializing String Variables – Reading Strings from Terminal – Writing Strings to Screen – Arithmetic Operations on Characters – Putting String Together – Comparison of Two Strings –String-Handling Functions – Table of Strings – Other Features of Strings

Unit-4: USER DEFINED FUNCTIONS AND STRUCTURE AND UNIONS**Teaching Hrs: 12**

User Defined Functions: Need for User Defined Functions – Elements of User Defined Functions – Definition of Functions – Return Values and Their Types – Function Calls – Function Declaration – Category of Functions: No Arguments and No Return Values – Arguments but no return values – Arguments with Return Values – No Arguments but Returns a value – Functions that Return Multiple Values – Nesting of Functions – Recursion – Passing Arrays – Strings to Functions – The Scope, Visibility and Lifetime of Variables.

Structure and Unions: Defining a Structure – Declaring Structure Variables – Accessing Structure Members – Structure Initialization and Copying and Comparing Structure Variable – Operations on Individual Members – Arrays of Structures – Arrays within Structures – Structures within Structures – Structures and Functions – Unions – Size of Structures

Unit-5: POINTERS AND FILE MANAGEMENT**Teaching Hrs: 12**

Pointers: Understanding Pointers – Accessing the Address of Variable – Declaring, Initialization of Pointer Variables – Accessing a Variable through its pointer – Chain of Pointers – Pointer

Expression – Pointers and Character Strings – Pointers as Function Arguments – Functions Returning Pointers.

File Management in C: Defining and Opening a File – Closing a File – Input/Output Operations on File – Error Handling during I/O Operations – Random Access to Files.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

1. Book review and research paper review, syllabus and curriculum review.
2. Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
3. Workshops, preparing technical term dictionaries from text books and reference books.
4. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
5. Forming digital library: collecting text and reference books, course material.
6. Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
7. Extracurricular and cultural activities may be framed through the syllabus content.
8. Grouping students for self discussion, self learning process.
9. Following institution and intellectual and writing reports in the course field.
10. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
11. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
12. Extracurricular activities may be framed through their syllabus content.
13. Bring the industries to the campus. Bring the students to the industry.
14. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

- Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013. (Unit I to IV)
- How to Solve it by Computer, R.G.Dromey, PHI International (Unit V)

Reference Books:

- The C Programming Language (ANSI C), Kernighan, B.W. and Ritchie, D.M., PHI.
- C by Discovery , Foster & Foster , Penram International Publishers, Mumbai.

Course Material:

E-References

- NPTEL, Introduction to C Programming, Prof.SatyadevNandakumar , IIT, Computer Science and Engineering Kanpur.

- NPTEL, Introduction to Problem Solving & Programming, by Prof. Deepak Gupta
Department of Computer Science and Engineering IIT Kanpur.

Mapping with Programme Outcomes

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

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

Semester	I	PROGRAMMING IN C LAB	Credit	3
Code	23U1AICP01		Hours	4

COURSE OBJECTIVES

1. To understand concepts of for/while loop and switch.
2. To understand language Functions and recursions.
3. To understand and develop String Manipulations.
4. To understand the basic concepts of searching and sorting.
5. To understand the concepts of structures.

COURSE OUTCOMES

- After studied, the student will be able to Enhance the analyzing and problem solving skills and use the same for writing programs in C
- After studied, the student will be able to Write diversified solutions, draw flowcharts and develop a well-documented and indented program according to coding standards
- After studied, the student will be able to Learn to debug a given program and execute the C program
- After studied, the student will be able to have enough practice the use of conditional and looping statements
- After studied, the student will be able to implement arrays, functions and pointers.

MATCHING TABLE

unit	i. remembering	ii. understanding	iii. applying	iv. analyzing	v. evaluating	vi. creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

List of Practical Exercises**Control Statements:**

1. Print n Fibonacci numbers – (using for)
2. Print n Prime numbers – (using while)
3. Simple Arithmetic on Two Numbers – (using switch/case)

Functions:

4. Swap two values using Call by Value / Call by Reference.

Recursion:

5. To Compute GCD and LCM

String Manipulation:

6. Operations on string such as Length, Concatenation, Reverse & copy of a string to another.

Matrices:

7. Matrix Addition, Subtraction, Transpose of $n \times m$ matrices.
8. Inverse of a Square Matrix.

Structures:

9. Students Mark statement

Pointers:

10. Arithmetic operations on pointers.

Files

11. Creating/ Reading/ Writing a text file.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a) Book review and research paper review, syllabus and curriculum review.
- b) Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- c) Workshops, preparing technical term dictionaries from text books and reference books.
- d) Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e) Forming digital library: collecting text and reference books, course material.
- f) Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- g) Extracurricular and cultural activities may be framed through the syllabus content.
- h) Grouping students for self discussion, self learning process.
- i) the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- j) Extracurricular activities may be framed through their syllabus content.
- k) Bring the industries to the campus. Bring the students to the industry.
- l) Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Reference Book:

1. Programming in ANSI C, E. Balagurusamy, Tata McGrawhill Education, 6th Edition, 2013.

MAPPING WITH PROGRAMME OUTCOMES

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

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

Semester	I	DISCRETE MATHEMATICS	Credit	3
Code	23U1IMAGE03		Hours	5

Course Objectives

1. Introduce concepts of mathematical logic for analyzing propositions and proving theorems.
2. Use sets for solving applied problems, and use the properties of set operations algebraically
3. Work with relations and investigate their properties.
4. Investigate functions as relations and their properties.
5. Introduce basic concepts of graphs, digraphs and trees.

Course Outcomes

1. Analyze logical propositions via truth tables.
2. Prove mathematical theorems using mathematical induction.
3. Understand sets and perform operations and algebra on sets.
4. Determine properties of relations identify equivalence and partial order relations, sketch relations.
5. Identify functions and determine their properties

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: RECURRENCE RELATIONS AND GENERATING FUNCTIONS Teaching Hours: 19

Recurrence - Polynomials and their Evaluations - Recurrence Relations - Solution of Finite Order Homogeneous [linear] Relations - Solutions of Non-homogeneous Relations.

Unit-2: MATHEMATICAL LOGIC**Teaching Hours: 18 Hrs.**

TF Statements - Connectives - Atomic and Compound Statements - Well-formed [Statement Formulae] - Parsing - Truth Table of a Formula - Tautology - Tautological Implications and Equivalence of Formulae.

Unit-3: MATHEMATICAL LOGIC**Teaching Hours: 18 Hrs.**

Replacement process - Functionally complete sets of connectives and Duality law – Normal Forms - Principal Normal Forms.

Unit-4: LATTICES**Teaching Hours: 18 Hrs.**

Lattices [omit example 15 Pp No.10.6) - Some properties of Lattices - New Lattices (omit remark Pp 10.14) - Modular and Distributive Lattices (omit theorem 10 and 17, Example 4 - Pp 10.23, Example 11 - Pp 10.24)

Unit-5: BOOLEAN ALGEBRA**Teaching Hours: 18 Hrs.**

Boolean Algebra - Boolean Polynomials - Karnaugh Maps

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- Book review and research paper review, syllabus and curriculum review.
- Data collection and paper writing practices: books level, field study level. Using the course study for society and nature development – exercise
- Workshops, preparing technical term dictionaries from text books and reference books.
- Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- Forming digital library: collecting text and reference books, course material.
- Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- Extracurricular and cultural activities may be framed through the syllabus content.
- Grouping students for self discussion, self learning process.
- Following institution and intellectual and writing reports in the course field.
- Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.

Text Book:

- P. Duraipandian and S .Udayabaskaran,(1997) Allied Mathematics, Vol. I & II Muhil Publishers, Chennai.

Reference Books:

- P.Balasubramanian and K.G.Subramanian,(1997) Ancillary Mathematics. Vol. I & II. Tata McGraw Hill, New Delhi.
- S.P.Rajagopalan and R.Sattanathan,(2005) Allied Mathematics Vol. I & II. Vikas Publications, New Delhi.
- P.R.Vittal (2003) Allied Mathematics .Marghan Publications, Chennai
- P.Kandasamy, K.Thilagavathy (2003) Allied Mathematics Vol-I, II S.Chand& company Ltd., New Delhi-55.
- Isaac, Allied Mathematics. New Gamma Publishing House, Palayamkottai.

Course Material: website links, e-Books and e-journals

Mapping with Programme Outcomes

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

PO – Programme Outcome, CO – Course outcome

S – Strong , M – Medium, L – Low (may be avoided)

 **SEMESTER – II** 

Paper type: Core Theory – Paper 2**JAVA PROGRAMMING****COURSE OBJECTIVES**

1. To know about a General-purpose and Purely object-oriented programming language including data types.
2. To understand the concept of garbage collection and operators
3. To know about the concept of Array and string
4. To know about the concept of Files
5. To understand the concept of Applets

COURSE OUTCOMES

1. After studied unit-1, the student will be able to understand the concept of General- purpose and Purely object-oriented programming language including data types and classes
2. After studied unit-2, the student will be able to understand the concept of loops
3. After studied unit-3, the student will be able to understand the concepts of Arrays
4. After studied unit-4, the student will be able to understand the concepts of Files
5. After studied unit-5, the student will be able to understand the concept of internet programming using applets and GUI-based

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

Unit-1: OVERVIEW OF JAVA LANGUAGE**Teaching Hours: 12 Hrs.**

Overview of Java Language: Introduction – simple java program-Java program structure-Java Tokens-Implementing a Java program Constants, variables, Data Types and Operators: Constants-variables-Data Types-Declaration of variables Operators and Expression

Unit-2: CLASSES, OBJECTS AND METHODS**Teaching Hours: 13 Hrs.**

Classes, objects and Methods: Defining a classes – Field and method declaration – creating objects – constructors – methods overloading – static members – Abstract class. Array: Introduction – One Dimensional Array-Creating Array-Two dimensional Array

Unit-3: INHERITANCE, INTERFACE & PACKAGES**Teaching Hours: 15 Hrs.**

Inheritance: Extending a class – Overriding methods. Interfaces: Defining Interface – Extending Interface. Packages: Java API package – creating package – Accessing Package.

Unit-4: APPLETS and GRAPHICS PROGRAMMING**Teaching Hours: 13 Hrs.**

Applet Programming: Building Applet Code – Applet Life Cycle – Designing a web page – Applet Tag – Running the Applet. Graphics Programming: The Graphics Class – Lines and Rectangle- Drawing Arcs – Drawing Polygons – Line Graphics

Unit 5: MULTITHREADED PROGRAMMING**Teaching Hours: 12 Hrs.**

Multithreaded Programming: Introduction – Creating Thread – Extending the Thread Class – Life cycle of the Thread – Thread Exception – Thread Priority.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- Book review and research paper review, syllabus and curriculum review.
- Workshops, preparing technical term dictionaries from text books and reference books.
- Forming digital library: collecting text and reference books, course material.
- Villages, institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- Extracurricular and cultural activities may be framed through the syllabus content.
- Grouping students for self discussion, self learning process.
- Following institution and intellectual and writing reports in the course field.
- For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- Extracurricular activities may be framed through their syllabus content.
- Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Textbooks:

- Balagurusamy, “Programming in Java”, 4th Edition 2010, TMH, New Delhi.
- John R. Hubbard, “Programming With Java”, 2nd Edition, TMH.

Reference Books:

- Hebert Schild, 2002, The Complete Reference Java2, [Fifth Edition]. Tata McGraw-Hill, New Delhi.
- John Hubbard, R. 2004. Programming with Java. [Second Edition]. Tata McGraw-Hill, New Delhi.
- Sagayaraj, Denis, Karthik and Gajalakshmi 2018, Java Programming for core and advanced Learners, University Press India Pvt. Ltd., Hyderabad.

Mapping with Programme Outcomes

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

PO – Programme Outcome, CO – Course outcome

S – Strong, M – Medium, L – Low (may be avoided)

Paper type: Core Practical – Practical - 2

JAVA PROGRAMMING LAB**Course Objectives**

1. To understand the concepts of classes and objects.
2. To know about layout managers.
3. To gain knowledge of frames and menus.
4. To understand the concept of RMI.
5. To learn how to handle exceptions.

Course Outcomes

1. After studied unit-1, the student will be able to understand the concept of purely object-oriented programming language including data types and classes.
2. After studied unit-2, the student will be able to implement layout managers.
3. After studied unit-3, the student will be able to develop an application using frames.
4. After studied unit-4, the student will be able to understand the concepts of RMI.
5. After studied unit-5, the student will be able to handle exceptions in program.

Matching Table

Unit	i. Remembering	ii. Understanding	iii. Applying	iv. Analyzing	v. Evaluating	vi. Creating
1	No	No	No	No	No	No
2	Yes	Yes	Yes	Yes	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

LIST OF PRACTICAL EXERCISES

1. Write a Java Applications to extract a portion of a character string and print the extracted string.
2. Write a Java Program to implement the concept of multiple inheritance using Interfaces.
3. Write a Java Program to create an Exception called payout-of-bounds and throw the exception.
4. Write a Java Program to draw several shapes in the created windows.
5. Write a Java Program to create a frame with four text fields name, street, city and pin code with suitable tables. Also add a button called “my details”, When the button is clicked its corresponding values are to be appeared in the text fields.
6. Write a Java Program to demonstrate the Multiple Selection List-box.
7. Write a Java Program to create a frame with three text fields for name, age and qualification and a text field for multiple line for address
8. Write a Java Program to create Menu Bars and pull down menus.

Internal Assessment Methods: (The following items may be brought under test, seminar and assignment framework)

- a. Book review and research paper review, syllabus and curriculum review.
- b. Data collection and paper writing practices: books level, field study level.
Using the course study for society and nature development – exercise

- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
- e. Forming digital library: collecting text and reference books, course material.
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- g. Extracurricular and cultural activities may be framed through the syllabus content.
- h. Grouping students for self discussion, self learning process.
- i. Following institution and intellectual and writing reports in the course field.
- j. Bloom Taxonomy may be introduced for teaching, learning and evaluation process within the framework of question setting pattern and internal assessment pattern.
- k. For application oriented study: Villages, Institutions, various people groups may be adopted by the departments of the colleges for practicing their theoretical study. Innovative methods may be implemented in the practices and report can be written for documentation, further discussion and research.
- l. Extracurricular activities may be framed through their syllabus content.
- m. Bring the industries to the campus. Bring the students to the industry.
- n. Ph.D. Research Methodology is applicable to write project report and any kind of research reports like assignment, seminar papers, case study reports, etc.

Mapping with Programme Outcomes

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

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Paper type: Allied
OPERATIONS RESEARCH

COURSE OBJECTIVES

1. To introduce the students how to use variables for formulating complex mathematical models in management science, industrial engineering and transportation science.
2. To provide the students with opportunity of using various software package for solving linear programming and integer programming models
3. To introduce the students to the use of basic methodology for the solution of linear programs and integer programs.
4. To introduce the students to the basic concepts of polyhedral theory and valid inequalities and how to integrate the theory to the solution methods for integer programming.
5. To introduce the students to the advanced methods for large-scale transportation and assignment problems.

COURSE OUTCOMES

1. Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
2. Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems
3. Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.
4. Model competitive real-world phenomena using concepts from game theory. Analyse pure and mixed strategy games
5. Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

Matching Table

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4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes

UNIT-1:

Teaching Hours: 18 Hrs.

Linear programming problem - Mathematical formulation of the problem - Graphical solution method - Simplex method - The Big-M method -Duality - Dual simplex method (Simple Problems).

UNIT-2: Partial Differential Equations

Teaching Hours: 18 Hrs.

Definitions of the transportation model - Formulation and solution of transportation Models_ Finding an initial basic feasible solution (NWCM - LCM -VAM) - Degeneracy in Transportation Problem -Transportation Algorithm (MODI Method)

UNIT-3:**Teaching Hours: 19 Hrs.**

Definition of Assignment models - Mathematical representation of assignment models – Comparison with the transportation models - Solution of the assignment model - The Hungarian methods for solution of the assignment models - variation of the assignment problem .Travelling salesman problem.

UNIT-4 : Vector Analysis**Teaching Hours: 18 Hrs.**

Games and Strategies - Two person zero sum - Some basic terms - the maximin-minimax principle – saddlepoints - Games without saddle points-Mixed strategies - graphic solution $2 \times n$ and $m \times 2$ games.

UNIT-5: Vector Analysis (continued)**Teaching Hours: 18 Hrs.**

Simulation - application - advantages and disadvantages - Monte Carlo method - simple problems.

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- c. Workshops, preparing technical term dictionaries from text books and reference books.
- d. Preparing question paper by the candidates: objective type, descriptive type, training can be given by the teacher
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Text book:

1. Gupta P.K. and Hira D.S., (2000) Problems in Operations Research, S.Chand & Co. Delhi

Reference Books:

1. J.K.Sharma, (2001) Operations Research: Theory and Applications, Macmillan, Delhi
2. V.K.Kapoor [1989] *Operations Research*, sultan Chand & sons.
3. Ravindran A., Philips D.T. and Solberg J.J., (1987) *Operations research*, John Wiley & Sons, New York.
4. Taha H.A. (2003) *Operations Research*, Macmillan Publishing Company, New York.
5. S.J.Venkatesan, *Operations Research*, J.S. Publishers, Cheyyar-604 407.

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

PO – Programme Outcome, CO – Course outcome
 S – Strong , M – Medium, L – Low (may be avoided)