

**CAUVERY COLLEGE FOR WOMEN  
(AUTONOMOUS)  
Nationally Accredited with 'A' Grade by NAAC  
ISO 9001:2015 Certified  
TIRUCHIRAPPALLI**

**PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE**



**B.SC. COMPUTER SCIENCE**

**SYLLABUS**

**2022 -2023 and Onwards**

**CAUVERY COLLEGE FOR WOMEN (AUTONOMOUS)  
PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE**

**VISION**

To create an ambience for a quality academic erudition which drives technologically adept, innovative and globally competent graduates with ethical values

**MISSION**

- To have a breath of knowledge across the subject areas of Computer Science
- To professionally enrich the students for successful career in Academia, Industry and Research
- To promote and inculcate ethics and code of professional practice among students

## PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

<b>PEOs</b>	<b>Statements</b>
<b>PEO1</b>	<b>LEARNING ENVIRONMENT</b> To facilitate value-based holistic and comprehensive learning by integrating innovative learning practices to match the highest quality standards and train the students to be effective leaders in their chosen fields.
<b>PEO2</b>	<b>ACADEMIC EXCELLENCE</b> To provide a conducive environment to unleash their hidden talents and to nurture the spirit of critical thinking and encourage them to achieve their goal.
<b>PEO3</b>	<b>EMPLOYABILITY</b> To equip students with the required skills in order to adapt to the changing global scenario and gain access to versatile career opportunities in multidisciplinary domains.
<b>PEO4</b>	<b>PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY</b> To develop a sense of social responsibility by formulating ethics and equity to transform students into committed professionals with a strong attitude towards the development of the nation.
<b>PEO5</b>	<b>GREEN SUSTAINABILITY</b> To understand the impact of professional solutions in societal and environmental contexts and demonstrate the knowledge for an overall sustainable development.

**PROGRAMME OUTCOMES FOR B.Sc Computer Science,**

**B.Sc Computer Science with Cognitive Systems , BCA,**

**B.Sc Information Technology**

<b>PO NO.</b>	On completion of B. Sc Computer Science / B. Sc Computer Science with Cognitive Systems / BCA/ B. Sc Information Technology Programme, the students will be able to
<b>PO 1</b>	<b>ACADEMIC SKILLS &amp; SOCIAL RESPONSIBILITY</b> Apply Computing, Mathematical and Scientific Knowledge in Various disciplines by understanding the concerns of the society.
<b>PO 2</b>	<b>CRITICAL THINKING AND INNOVATIVE PROGRESS</b> Design the software applications with varying intricacies using programming languages for innovative learning in techno world to meet the changing demands.
<b>PO 3</b>	<b>PERSONALITY DEVELOPMENT</b> Perceive Leadership skills to accomplish a common goal with effective communication and understanding of professional, ethical, and social responsibilities.
<b>PO 4</b>	<b>LIFELONG LEARNING</b> Identify resources for professional development and apply the skills and tools necessary for computing practice to gain real life experiences.
<b>PO 5</b>	<b>CREATIVITY AND HOLISTIC APPROACH</b> Create a scientific temperament and novelties of ideas to support research and development in Computer Science to uphold scientific integrity and objectivity.

## **PROGRAMME SPECIFIC OUTCOMES FOR B.Sc COMPUTER SCIENCE**

<b>PSO NO.</b>	<b>The students of B.Sc Computer Science will be able to</b>	<b>POs Addressed</b>
PSO 1	Identify, analyze, design an optimized solution using appropriate algorithms of varying complexity using cutting edge technologies	PO 1 PO 2 PO 5
PSO 2	Attain a solid foundation in the Programming languages and to formulate computational solutions to real life problems	PO 1 PO 2 PO 4 PO 5
PSO 3	Equip the skills to utilize tools and technologies in computer science to meet the industrial needs and to communicate effectively among peers	PO 3 PO 4
PSO 4	Develop skills in software and hardware so as to enable them to establish a productive career in industry, research, academia and also as an entrepreneur	PO 1 PO 4 PO 5
PSO 5	Implement independent projects of their own choice using latest tools and also work as an effective team member to attain the predefined goals.	PO 3 PO 4 PO 5



**Cauvery College for Women(Autonomous), Trichy**

PG & Research Department of Computer Science

B.Sc Computer Science

**LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK(CBCS – LOCF)**

(For the Candidates admitted from the Academic year 2022-2023 and onwards)

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam			Total	
							Hrs.	Marks			
								Int	Ext		
I	I	Language Course-I (LC)	Ikkala Ilakiyam	22ULT1	6	3	3	25	75	100	
			Hindi Literature & Grammar - 1	22ULH1							
			History of popular tales, Literature and Sanskrit story	22ULS1							
			Basic French - I	22ULF1							
	II	English Language Course-I(ELC)	Functional English for Effective Communication -I	22UE1	6	3	3	25	75	100	
	III		Core Course – I(CC)	Programming in C	22UCS1CC1	5	5	3	25	75	100
			Core Practical - I (CP)	Programming in C (P)	22UCS1CC1P	3	3	3	40	60	100
			First Allied Course- I (AC)	Essential Mathematics	22UCS1AC1	4	3	3	25	75	100
			First Allied Course- II (AC)	Numerical Analysis and Statistics	22UCS1AC2	4	3	3	25	75	100
	IV	Ability Enhancement Compulsory Course-I (AECC)	UGC Jeevan Kaushal- Universal Human Values	22UGVE	2	2	-	100	-	100	
<b>Total</b>					<b>30</b>	<b>22</b>				<b>700</b>	
II	I	Language Course-II(LC)	Idaikkaala Ilakkiyamum Puthinamum	22ULT2	5	3	3	25	75	100	
			Hindi Literature & Grammar - II	22ULH2							
			Poetry, Textual Grammar and Alankara	22ULS2							
			Basic French - II	22ULF2							
	II	English Language Course-II(ELC)	Functional English for Effective Communication –II	22UE2	6	3	3	25	75	100	
	III		Core Course – II (CC)	Programming in Java	22UCS2CC2	5	5	3	25	75	100
			Core Practical - II (CP)	Java Programming (P)	22UCS2CC2P	3	3	3	40	60	100
			Core Practical -III (CP)	Data Visualization (P)	22UCS2CC3P	3	3	3	40	60	100
			First Allied Course – III (AC)	Operations Research	22UCS2AC3	4	3	3	25	75	100
	IV		Ability Enhancement Compulsory Course-II (AECC)	Environmental Studies	22UGEVS	2	2	-	100	-	100
Ability Enhancement Compulsory Course-III (AECC)			Innovation and Entrepreneurship	22UGIE	2	1	-	100	-	100	
Extra Credit Course			SWAYAM	As per UGC Recommendation							
<b>Total</b>					<b>30</b>	<b>23</b>				<b>800</b>	

III	I	Language Course-III (LC)	Kaappiyamum, Naadakamum	22ULT3	5	3	3	25	75	100	
			Hindi Literature & Grammar - III	22ULH3							
			Prose, Textual Grammar and vakyarachana	22ULS3							
			Intermediate French - I	22ULF3							
	II	English Language Course-III(ELC)	Learning Grammar Through Literature- I	22UE3	6	3	3	25	75	100	
	III	Core Course– III(CC)	Data Structures & Algorithms	22UCS3CC3	6	6	3	25	75	100	
		Core Practical - IV(CP)	Data Structures (P)	22UCS3CC4P	3	3	3	40	60	100	
		Second Allied Course-I (AC)	Digital & Microprocessor Fundamentals	22UCS3AC4	4	3	3	25	75	100	
		Second Allied Course- II (AP)	Digital & Microprocessor (P)	22UCS3AC5P	4	3	3	40	60	100	
	IV	Generic Elective Course- I (GEC)	Office Automation (P)	22UCS3GEC1P	2	2	3	40	50	100	
			Basic Tamil – I	22ULC3BT1				25	75		
			Special Tamil - I	22ULC3ST1							
		Extra Credit Course	SWAYAM	As per UGC Recommendation							
	<b>Total</b>				<b>30</b>	<b>23</b>					<b>700</b>

**15 Days INTERNSHIP during Semester Holidays**

IV	I	Language Course - IV (LC)	Pandaiya Ilakkiyamum, Urainadaiyum	22ULT4	6	3	3	25	75	100
			Hindi Literature & Functional Hindi	22ULH4						
			Drama, History of drama Literature	22ULS4						
			Intermediate French - II	22ULF4						
	II	English Language Course – IV (ELC)	Learning Grammar Through Literature- II	22UE4	6	3	3	25	75	100
	III	Core Course – IV(CC)	Database Management Systems	22UCS4CC4	6	6	3	25	75	100
		Core Practical - V(CP)	SQL & PL/SQL (P)	22UCS4CC5P	4	4	3	40	60	100
		Second Allied Course- III (AC)	Microcontrollers	22UCS4AC6	4	3	3	25	75	100
		Internship	Internship	22UCS4INT	-	2	-	-	-	100
	IV	Generic Elective Course- II (GEC)	Multimedia (P)	22UCS4GEC2P	2	2	3	40	60	100
			Basic Tamil – II	22ULC4BT2				25	75	
			Special Tamil - II	22ULC4ST2						
		Skill Enhancement Course – I (SEC)	.NET Practical	22UCS4SEC1P	2	2	3	40	60	100
		Extra Credit Course	SWAYAM	As per UGC Recommendation						
<b>Total</b>				<b>30</b>	<b>25</b>					<b>800</b>

V	III	Core Course – V(CC)	Python Programming	22UCS5CC5	6	6	3	25	75	100	
		Core Practical – VI(CP)	Python Programming (P)	22UCS5CC6P	3	3	3	40	60	100	
		Core Course - VI(CC)	Operating Systems	22UCS5CC6	6	6	3	25	75	100	
		Core Course – VII(CC)	Computer Networks	22UCS5CC7	6	6	3	25	75	100	
		Discipline Specific Elective – I (DSE)	A. Computer Architecture	22UCS5DSE1A	5	4	3	25	75	100	
			B. Computer Graphics	22UCS5DSE1B							
			C. Artificial Intelligence	22UCS5DSE1C							
		IV	Ability Enhancement Compulsory Course-IV(AECC)	UGC Jeevan Kaushal - Professional Skills	22UGPS	2	2	-	100	-	100
			Skill Enhancement Course – II (SEC)	CISCO packet Tracer Practical	22UCS5SEC2P	2	2	3	40	60	100
		Extra Credit Course		SWAYAM	As per UGC Recommendation						
<b>Total</b>					<b>30</b>	<b>29</b>				<b>700</b>	
VI	III	Core Course – VIII(CC)	Cloud Computing	22UCS6CC8	6	6	3	25	75	100	
		Core Course – IX(CC)	Cyber Security	22UGCS	5	4	3	25	75	100	
		Core Practical –VII(CP)	Cloud Computing (P)	22UCS6CC7P	3	3	3	40	60	100	
		Core Practical – VIII(CP)	Open Source Technologies (P)	22UCS6CC8P	5	5	3	25	75	100	
		Discipline Specific Elective – II (DSE)	A. Software Engineering	22UCS6DSE2A	5	4	3	25	75	100	
			B. Fundamentals of Big data & IoT	22UCS6DSE2B							
			C. Open Source Technologies	22UCS6DSE2C							
		Project	Project Work	22UCS6PW	5	4	-	-	100	100	
		V	Ability Enhancement Compulsory Course-V(AECC)	Gender Studies	22UGGS	1	1	-	100	-	100
			Extension activity		22UGEA	0	1	0	-	-	-
<b>Total</b>					<b>30</b>	<b>28</b>				<b>700</b>	
<b>Grand Total</b>					<b>180</b>	<b>150</b>				<b>4400</b>	



## Courses & Credits for B.Sc Computer Science Programme

Part	Course	No. of Courses	Credits	Total Credits
I	Tamil / Other Language	4	12	12
II	English	4	12	12
III	Core (Theory & Practical)	17	77	109
	Project Work	1	4	
	Internship	1	2	
	First Allied	3	9	
	Second Allied	3	9	
	DSE	2	8	
IV	GEC	2	4	15
	SEC	2	4	
	AECC-I-Universal Human Values	1	2	
	AECC-II-Environmental Studies	1	2	
	AECC-III- Innovation and Entrepreneurship	1	1	
	AECC-IV Professional Skills	1	2	
V	Gender Studies	1	1	02
	Extension Activities	–	1	
	Total	44		150

**The Internal and External marks for theory and practical courses are as follows:**

<b>Course</b>	<b>InternalMarks</b>	<b>External Marks</b>
Theory	25	75
Practical	40	60
Project	-	100
Internship	25	75

**For Theory Courses:**

- a) The passing minimum for CIA shall be 40% out of 25 marks(i.e. 10 marks)
- b) The passing minimum for End Semester Examinations shall be 40% out of 75 marks(i.e. 30 marks)

**For Practical Courses:**

- a) The passing minimum for CIA shall be 40% out of 40 marks(i.e. 16 marks)
- b) The passing minimum for End Semester Examinations shall be 40% out of 60 marks (i.e. 24 marks)

**For Project Work:**

- a)The passing minimum not less than 40% out of 100 marks

**For Internship:**

- a) The passing minimum not less than 40% in the aggregate.

<b>Semester I</b>	<b>Internal Mark: 25</b>		<b>External Mark: 75</b>	
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>Hrs/Week</b>	<b>CREDITS</b>
<b>22UCS1CC1/ 22UCA1CC1/ 22UIT1CC1</b>	<b>PROGRAMMING IN C</b>	<b>CORE</b>	<b>5</b>	<b>5</b>

### Course Objectives

- To understand the basics of C language
- To get the deep knowledge of programming using C language
- To develop logics which will help them to create programs and applications in C
- Enhance skill on problem solving by constructing algorithms

### Course Outcomes and Cognitive Level Mapping

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

<b>CO Number</b>	<b>CO Statement</b>	<b>Cognitive Level</b>
CO1	Define the basic concepts of C Programming	K1
CO2	Illustrate the components of C programming	K2
CO3	Build algorithms and data structures swiftly and faster computation using programs	K3
CO4	Apply the knowledge of programming concepts to develop programs	K4
CO5	Solve real time problems using C	K5

### Mapping of CO with PO and PSO

	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>	<b>PSO4</b>	<b>PSO5</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>
<b>CO1</b>	2	2	2	1	1	2	2	2	3	2
<b>CO2</b>	3	2	3	1	1	3	3	2	3	2
<b>CO3</b>	3	3	3	2	2	3	3	2	3	3
<b>CO4</b>	3	2	3	2	2	2	2	2	3	3
<b>CO5</b>	3	3	3	2	2	3	3	2	2	3

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation “-” indicates there is no correlation.

## Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<b>Developing a program in C:</b> Algorithm-Pseudocode-Flowchart-Planning a C program- Writing a C program- Compile and Run a C Program- <b>Overview of C:</b> – Structure of C program – Character set-Tokens – Data types – Variables – Declaration of variables - symbolic constant – Operators and Expressions	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
II	<b>Managing Input and Output Operations:</b> Reading and Writing a character -Formatted Input and Output. <b>Decision Making and Branching:</b> If, Switch, The ?: operator - The GoTo Instruction – <b>Decision Making and Looping:</b> Introduction – While, DO, For Statements –Jumps in Loops.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<b>Array:</b> One dimensional array – Two and multidimensional array – Character array – String functions – <b>User-Defined Functions:</b> Need for User -Defined Functions –A Multi-Function Program-Elements of User-Defined Functions-Definition of Functions –Return values and Their Types-Function Calls- Function Declaration- Category of Functions – Nesting of Functions - Recursion - Storage Class-The scope and lifetime of variables in functions.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<b>Structures and Unions:</b> Structure definition – Structure Initialization – Array of structure – Array within structure –Structure within Structure-Union– <b>Pointers:</b> Understanding pointers - Accessing the address of a variable - Declaring and Initializing pointers - Accessing a variable through its pointers - Pointer Expressions - Pointers and Arrays - Pointers and Character strings.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<b>File Management:</b> Defining and Opening File –Closing a File – I/O operations on Files – error handling during I/O operations – Random Access to Files- Command Line Arguments.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<b>UNIT VI - Self Study for Enrichment</b> <b>(Not included for End Semester Examinations)</b> Develop algorithms for real time scenario, Area calculations, Conversion programs, swapping numbers (with and without using temporary variable). Programs for checking eligibility, Triangle formation, Sum of numbers, sum of series, Array manipulations (Sorting, searching, insert, delete and merging), String handling programs, Dynamic memory management using pointers, Employee pay bill preparation using Files.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

## Textbook

- Balagurusamy.E. (2017). Programming in ANSI C, 7<sup>th</sup> Edition, Mc Graw Hill Education New Delhi.
- Byron Gottfried. (2018). Programming with C, 4th Edition, Tata McGraw Hill.

## **References**

1. Yashavant Kanetkar, (2020). Let Us C, 16<sup>th</sup> Edition, BPB Publications, New Delhi.
2. Ashok N. Kamthane, Amit Ashok Kamthane (2015). Programming in C, 3<sup>rd</sup> Edition, Pearson India Education Services Pvt. Ltd.

## **Web References**

1. <https://www.learn-c.org/>
2. <https://www.cprogramming.com/>
3. <https://www.tutorialspoint.com/cprogramming/index.htm>

## **Pedagogy**

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

## **Course Designers**

1. Dr. M. Anandhi, Associate Professor, Department of Information Technology.
2. Ms. R. Sridevi, Assistant Professor, Department of Computer Applications.

SemesterI	InternalMarks:40		ExternalMarks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HRS./WEEK	CREDITS
22UCS1CC1P	PROGRAMMING IN C (P)	CORE	3	3

### Course Objective

- To provide the hands on experience on C Programming and improve the practical skill set
- The learner will be able to develop the logic for the given problem, recognize and understand the syntax and construction of C code
- To know the steps involved in compiling, linking and debugging C code, feel more confident about writing the C functions and some complex program

### Course Outcomes and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Understand and Implement the fundamentals of C Programming	K2,K3
CO2	Analyze the problem and develop skills on identifying appropriate Programming constructs for problem solving	K3,K4
CO3	Examine the problem and provide solution using control structures And Looping statements	K4,K6
CO4	Analyze the problem and create program using arrays and functions	K4,K6
CO5	Assess and solve the problems using structures and pointers	K5,K6

### Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3
CO5	3	3	3	3	3	3	3	2	3	3

“1”–Slight(Low) Correlation

“2”–Moderate(Medium)Correlation

“3”–Substantial (High) Correlation

“-”indicates there is no Correlation.

### List of Exercises

1. Datatypes& Operators
2. Control Statements
3. LoopingStatements
4. Functions

5. Arrays
6. String Handling Functions
7. Pointers
8. Structures
9. Command line Arguments
10. Reading data from file
11. Writing data into file

**Web References:**

1. <https://beginnersbook.com/2015/02/simple-c-programs/>
2. <https://www.javatpoint.com/c-programs>
3. <http://www.tutorialspoint.com/cprogramming/index.htm>
4. <http://www.w3schools.in/c>
5. <http://fresh2refresh.com/c-tutorial-for-beginners>

**Pedagogy:**

Power Point Presentations, Demo by e-Contents

**Course Designers:**

Ms.S.Saranya, Ms.N.Agalya

**FIRST ALLIED COURSE –I (AC)  
ESSENTIAL MATHEMATICS**

(For B.Sc Computer Science , B.Sc Information Technology & BCA)  
(2022-2023 and Onwards)

Semester I	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCS1AC1/ 22UCA1AC1/ 22UIT1AC1	ESSENTIAL MATHEMATICS	ALLIED	4	3

**Course Objective**

- **Apply** the basic concepts of Differentiation, Integration and their applications.
- **Compute** mathematical quantities using ordinary and partial differential equations.
- **Explore** fundamental concepts in graph theory.

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Remember and recall the basic concept of essential mathematics.	K1
CO2	Illustrate the various notions in the respective streams .	K2
CO3	Apply the different terminologies of essential mathematics.	K3
CO4	Classify the solution of mathematical problems using various techniques.	K4
CO5	Examine the solution of mathematical problems.	K4

**Mapping of CO with PO and PSO**

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3	3	3	3	2	3
CO2	3	3	3	3	3	3	3	3	3	2
CO3	3	2	3	3	3	3	3	3	2	2
CO4	3	2	2	3	3	3	3	3	3	2
CO5	3	2	3	3	3	3	3	3	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –  
“3” – Substantial (High) Correlation – “-” indicates there is no correlation.



## Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p><b>Matrices</b>            Matrix – Special types of matrices – Scalar multiplication of a matrix – Equality of matrices – Addition of matrices – Subtraction – Multiplication of Matrices – Inverse matrix– Relation between adjoint and inverse matrices – Solution of simultaneous equations – Rank of a matrix – A system of <math>m</math> homogeneous linear equations in <math>n</math> unknowns – System of non-homogeneous linear equations – Eigen values and Eigenvectors – Similar matrices – Cayley-Hamilton Theorem (proof not needed) – Simple applications only</p>	12	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4
II	<p><b>Differentiation</b>            Maxima and Minima (Problems Only) –Points of inflexion.  <b>Partial differentiation</b>            Functions of function rule – Total Differential Coefficient – A Special case – Implicit Functions – Homogeneous functions – Euler’s Theorem (proof not needed) – Simple problems only.</p>	12	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4
III	<p><b>Integration</b>            Integration of Rational algebraic functions – Rule (a) – Rule (b): Type i: <math>\int \frac{dx}{ax^2+bx+c}</math>, Type ii: <math>\int \frac{lx+m}{ax^2+bx+c} dx</math> – Integration of Irrational functions : Case (ii) Integration of the form <math>\int \frac{px+q}{\sqrt{ax^2+bx+c}}</math> – Type <math>\int \frac{dx}{a+bcosx}</math> – Properties of definite integrals.</p>	12	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4
IV	<p><b>Differential Equations</b>            Linear Differential Equation with constant coefficients – The Operators <math>D</math> and <math>D^{-1}</math> – Particular Integral – Special methods of finding P.I.: <math>X</math> is of the form (a) <math>e^{ax}</math> (b) <math>\cos ax</math> or <math>\sin ax</math>, where <math>a</math> is a constant (c) <math>x^m</math> (a power of <math>x</math>), <math>m</math> being a positive integer (d) <math>e^{ax}V</math>, where <math>V</math> is any function of <math>x</math>.</p>	12	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4
V	<p><b>Graph Theory</b>            Introduction – Definition of Graphs – Applications of Graphs – Finite and infinite graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph.  <b>Path and Circuits</b>            Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components – Euler graphs.</p>	12	CO1, CO2, CO3, CO4, CO5	K1,K2,K3, K4
VI	<p><b>Self-Study for Enrichment</b>  <b>(Not included for End Semester Examination)</b>            Symmetric matrix – Skew symmetric matrix –</p>	-	CO1, CO2, CO3,	K1,K2,K3, K4

	Hermitian and skew Hermitian matrices Concavity and Convexity– Integration by parts – Linear equation – Hamiltonian Paths and Circuits.		CO4, CO5	
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### Text Books

1. T.K.Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy.(2015). *Algebra, Volume II*. S. Viswanathan (Printers & Publishers) Pvt., Ltd.
2. S.Narayanan, T.K.Manicavachagom Pillay.(2015).*Calculus,Volume I*. S. Viswanathan (Printers & Publishers) Pvt., Ltd.
3. S.Narayanan, T.K.Manicavachagom Pillay.(2015).*Calculus,Volume II*. S. Viswanathan (Printers & Publishers) Pvt., Ltd.
4. S.Narayanan, T.K.Manicavachagom Pillay.(2015).*Calculus,Volume III*. S. Viswanathan (Printers & Publishers) Pvt., Ltd.
5. Narsingh Deo. (2003). *Graph Theory with applications to Engineering and Computer*. Prentice Hall of India Private Limited

UNIT-I Chapter 2: Section 1 to 5, 7, 8, 10 to 16[1]

UNIT-II Chapter V: Section 1.1 to 1.5[2]

Chapter VIII: Section 1.2 to 1.6[2]

UNIT-III Chapter 1: Section 7.1 to 7.3, 8 (CASE II), 9, 11[3]

UNIT-IV Chapter 2: Section 1 to 4[4]

UNIT-V Chapter 1: Section 1.1 to 1.5[5]

Chapter 2: Section 2.1, 2.2, 2.4 to 2.6[5]

### Reference Books

1. A.Singaravelu. (2003). *Allied Mathematics*. A.R.Publications
2. P.R.Vittal. (2014). *Allied Mathematics*. Margham Publications, Chennai.
3. S.Arumugam and S.Ramachandran.(2006). *Invitation to Graph Theory*. Sci Tech Publications (India) Pvt Ltd., Chennai

### Weblinks

1. <https://youtu.be/rowWM-MijXU>
2. <https://youtu.be/TOvxWaOnrqI>
3. <https://youtu.be/pvLj1s7SOtk>
4. [https://youtu.be/Gxr3AT4NY\\_Q](https://youtu.be/Gxr3AT4NY_Q)
5. <https://youtu.be/xlbbefbYLzg>
6. <https://youtu.be/b0R.JkIBhfEM>
7. <https://youtu.be/s5KZw1EpBEo>

## **Pedagogy**

Assignment, Seminar, Lecture, Quiz, Group discussion, Brain storming, e-content.

## **Course Designers**

1. Dr. V. Geetha
2. Dr. S. Sasikala

**FIRST ALLIED COURSE-II (AC)**  
**NUMERICAL ANALYSIS AND STATISTICS**

(For B.Sc Computer Science , B.Sc Information Technology & BCA)

Semester I	Internal Marks: 25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs / Week	CREDITS
22UCS1AC2/ 22UCA1AC2/ 22UIT1AC2	NUMERICAL ANALYSIS AND STATISTICS	ALLIED	4	3

(2022-2023 and Onwards)

### Course Objective

- **Understand** the implementation of various methods of Numerical Analysis.
- **Organize** and **summarize** the statistical data.
- **Analyze** and **evaluate** the strengths of the conclusions based on data.

### Course Outcomes

#### Course Outcome and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Understand the list of basic ideas of Numerical Methods and Statistics.	K1, K2
CO2	Solve the problems using various methods and also classify the given datas.	K2, K3
CO3	Identify the conceptual collection and classification of variables.	K3
CO4	Analyze the accuracy and graphical representation of statistical datas.	K4
CO5	Support the implementation of numerical methods and statistical datas.	K4

## Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3	3	3	2	3	2
CO2	3	3	2	2	2	3	2	3	2	3
CO3	2	3	3	2	2	2	3	3	2	3
CO4	3	2	3	2	2	3	3	2	3	2
CO5	3	3	2	3	3	3	2	2	3	3

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –  
 “3” – Substantial (High) Correlation – “-” indicates there is no correlation.

## Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p><b>Solution of Algebraic &amp; Transcendental Equations:</b>                      Introduction – The Bisection Method – The Iteration Method – Newton-Raphson Method (Problems Only)</p> <p><b>Interpolation:</b>                      Finite Differences: Forward Differences, Backward Differences – Newton’s Formulae for Interpolation – Interpolation with unevenly spaced Points: Lagrange’s Interpolation formula</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	<p><b>Numerical Integration:</b>                      Numerical Integration: Simpson’s 1/3-Rule – Simpson’s 3/8-Rule (proof not needed).</p> <p><b>Linear Systems of Equations:</b>                      Solution of Linear Systems–Direct Methods: Gaussian Elimination Method – Solutions of Linear Systems – Iterative Methods (Problems Only)</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	<p><b>Numerical solution of Ordinary Differential Equations:</b>                      Introduction – Euler’s Method – Modified Euler’s Method – Runge-Kutta Methods – Predictor - Corrector Methods : Adams-Moulton Method</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	<p><b>Measures of Central Tendency:</b>                      Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean.</p> <p><b>Measures of Dispersion:</b>                      Mean Deviation – Standard Deviation (Simple Problems Only)</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

V	<p><b>Correlation:</b> Introduction – Meaning of Correlation – Scatter Diagram – Karl Pearson’s co-efficient of Correlation – Rank Correlation: Spearman’s Rank Correlation Coefficient (Derivation not needed and Simple Problems Only).</p> <p><b>Linear Regression:</b> Introduction – Linear Regression (Derivation not needed and Simple Problems Only)</p>	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	<p><b>Self Study for Enrichment:</b> (Not included for End Semester Examination)</p> <p>The method of False Position &amp; Central Differences - Trapezoidal rule - Solution by Taylor’s Series and Milne’s Method - Range – Quartile Deviation - Rank Correlation (Repeated Ranks).</p>	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

### Text Books

1. Sastry S. S. (1998). Introductory methods of Numerical Analysis, Third Edition. Prentice Hall of India Private Limited.
2. Gupta. S.C & Kapoor, V.K (2007). Fundamentals of Mathematical Statistics. Sultan Chand & sons, New Delhi.

UNIT – I Chapter 2: Sections 2.1 - 2.3(Omit 2.3.1), 2.5(Omit 2.5.1) [1]

Chapter 3: Sections 3.3 (Omit 3.3.4), 3.6, 3.9(3.9.1only) [1]

UNIT – II Chapter 5: Sections 5.4(5.4.2 & 5.4.3 only) [1]

Chapter 6: Sections 6.3(6.3.2 only) & 6.4 [1]

UNIT – III Chapter 7: Sections 7.1, 7.4- 7.6 (Omit 7.4.1 & 7.6.2) [1]

UNIT – IV Chapter 2: Sections 2.5 - 2.9, 2.13 (Omit 2.13.1 & 2.13.2) [2]

UNIT –V Chapter 10: Sections 10.1 - 10.4, 10.7(10.7.1 Only) [2]

Chapter 11: Sections 11.1 & 11.2 [2]

### Reference Books

1. Jain M. K, Iyengar S. R.K. and Jain R.K. (1999). Numerical Analysis Numerical Methods for Scientific and Engineering Computations. New Age International Private Limited.
2. Froberg C.E. (1979). Introduction to Numerical Analysis. II Edition. Addison Wesley

## **Web Links**

1. <https://youtu.be/qCzUXav5Nk>
2. <https://youtu.be/r6MTvrI8SQ4>
3. <https://youtu.be/s05dONL4xAs>
4. <https://youtu.be/XaHFNhHfXwQ>
5. <https://youtu.be/zPG4NjIkCjc>

## **Pedagogy**

Power point presentations, Group Discussions, Seminar, Quiz, Assignment.

## **Course Designers**

1. Dr.R.Buveneswari
2. Ms.A.Gowri Shankari

Semester I			Marks:100	
COURSE CODE	COURSE TITLE	CATEGORY	Hours /Week	CREDITS
22UGVE	UGC JEEVAN KAUSHAL - UNIVERSAL HUMAN VALUES	ABILITY ENHANCEMENT COMPULSORY COURSE-I (AECC)	2	2

### Course Objectives

1. To enable the learners to learn the values of love and compassion.
2. To foster the values of righteousness and service among the learners.
3. To enhance the morale of the learners by inculcating the values renunciation and peace.
4. To inspire the learners to practice the basic human values so as to make them become responsible citizens of the Nation.

### Course Outcomes and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Define, Recall, explain, demonstrate and outline, Meaning, Definition the values of Love, Compassion, Truth, Non-Violence, Ahimsa, Righteousness and Service, Renunciation (sacrifice) & Peace.	K1, K2
CO2	Identify and apply the values of Love, Compassion, Truth, Non-Violence, Ahimsa, Righteousness and Service, Renunciation (sacrifice) & Peace.	K3
CO3	Analyse, categorize, compare, list, the values of Love, Compassion, Truth, Non-Violence, Ahimsa, Righteousness and Service, Renunciation (sacrifice) & Peace.	K4
CO4	Explain the values of Love, Compassion, Truth, Non-Violence, Ahimsa, Righteousness and Service, Renunciation (sacrifice) & Peace.	K5
CO5	Elaborate and Discuss the values of Love, Compassion, Truth, Non-Violence, Ahimsa, Righteousness and Service, Renunciation (sacrifice) & Peace.	K6



# Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p><b>Love and Compassion</b></p> <p><b>Introduction:</b> what is love? Forms of love for self, parents family friend, spouse community, nation, humanity and other beings both for living and non-living.</p> <p>Love and Compassion and Inter-relatedness</p> <p>Love, compassion, empathy, sympathy and nonviolence</p> <p>Individuals who are remembered in history for practicing compassion and love.</p> <p>Narratives and anecdotes from history, literature including local Folklore</p>	6	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>
II	<p><b>Truth and Non - Violence</b></p> <p><b>Introduction:</b> what is truth? Universal truth, truth as value, truth as fact (veracity. sincerity, honesty among others)</p> <p>Individuals who are remembered in history for practicing this value</p> <p>Narratives and anecdotes from history, literature including local folklore</p> <p><b>Introduction:</b> what is non violence? Its need. Love, compassion, empathy sympathy for others as prerequisites for non violence Ahimsa as non -violence and non- killing.</p> <p>Individuals and organisations that are known for their commitment to non - violence</p> <p>Narratives and anecdotes about non - violence from history and literature including local Folklore</p>	7	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>
	<p><b>Righteousness and Service</b></p> <p><b>Introduction:</b> What are Righteousness and service?</p> <p>Righteousness and dharma, Righteousness and Propriety</p>			

III	<p>Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings-living and non-living persons in distress for disaster.</p> <p>Individuals who are remembered in history for practicing Righteousness and Service</p> <p>Narratives and anecdotes dealing with instances of Righteousness and Service from history, literature, including local Folklore</p>	6	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>
IV	<p><b>Renunciation (sacrifice) &amp; Peace</b></p> <p><b>Introduction:</b> What is renunciation? Renunciation and sacrifice. Self-restraint and ways of overcoming greed. Renunciation with action as true renunciation. What is peace? It's need, relation with harmony and balance.</p> <p>Individuals who are recommended in history for practicing Renunciation and sacrifice. Individuals and organisations that are known for their commitment to peace.</p> <p>Narratives and anecdotes from history and literature including local folklore about individuals who are remembered for their renunciation and sacrifice. Narratives and anecdotes about peace from history and literature including local folklore practicing peace</p>	6	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>
V	<p><b>Practicing human values:</b> what will learners learn gain if they practice human values? What will learners lose if they Don't Practice human values?</p> <p>Sharing learner's individual and/ or group experience(s)</p> <p>Simulated situations</p> <p>Case studies</p> <p>.</p>	5	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>
VI	<p><b>Self Study for Enrichment</b></p> <p>Learners need to list ways of practising the values Love and Compassion, Truth and non-violence, Righteousness and Service, Renunciation (sacrifice) &amp; Peace. Group Discussion needs to be conducted on strategies to promote human values at various levels – family, community, society, nation and global.</p>	-	CO1, CO2, CO3, CO4, CO5, CO6	<b>K1, K2, K3, K4, K5, K6</b>

## Website References

1. <http://gurdjiefffourthway.org/pdf/LOVE%20AND%20COMPASSION.pdf>
2. <https://iosrjournals.org/iosr-jhss/papers/Vol18-issue4/H01846769.pdf>
3. <https://www.youtube.com/watch?v=JaxIp8dyBBQ>
4. <https://core.ac.uk/download/pdf/38646904.pdf>
5. [https://www.hartford.edu/unotes/\\_images/submitted\\_images/Renunciation%20as%20the%20Path%20to%20Happiness%20and%20Success\\_1603743763\\_file1.pdf](https://www.hartford.edu/unotes/_images/submitted_images/Renunciation%20as%20the%20Path%20to%20Happiness%20and%20Success_1603743763_file1.pdf)

## Pedagogy

Chalk & Talk, Seminar, PPT Presentation, Group Discussion, Blended Method, Flipped Classroom method, Case Presentation, video making, poster designing, preparation of Album and story writing .

Ability Enhancement Compulsory Course (AECC ) I : UGC Jeevan Kaushal -  
Universal Human Values (22UGVE)

Assessment Rubrics for 100 Marks

1. Designing Posters / video making / preparation of Album – 20 marks
2. Case study presentation / Narration of stories / Writing stories – 20 Marks
3. Writing essay based on the individual life experience following human values –personal, family and society level (minimum 10 pages) – 20 Marks
4. VIVA VOCE - 40 Marks

S.NO	Rubrics for VIVA VOCE	MARKS
1	Theoretical Knowledge	20
2	Values Practiced	10
3	Attitude & Commitment	10
<b>Total</b>		<b>40</b>

There will be no End Semester Examination for this course. The subject teacher will make an assessment of the students' performance based on the above-mentioned components and an internal VIVA VOCE will be conducted by the subject teacher and marks will be awarded and submitted to COE in the prescribed format specified by the Controller of Examinations with the approval of the Head of the respective Departments.

## Course Designer

Dr.G.Mettilda Buvaneswari

Semester II	Internal Mark: 25		External Mark: 75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCS2CC2/ 22UCA2CC2	PROGRAMMING IN JAVA	CORE	5	5

### Course Objectives

- To develop logics which will help them to create programs
- To get a deep knowledge of programming using JAVA language
- To understand the basics of OOPs concepts
- Enhance problem solving skill

### Course Outcomes and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, the students will be able to	
CO1	Recite the basic programming skills	K1
CO2	Understand the Java features	K2
CO3	Analyze OOPs concepts	K4
CO4	Apply the programming skills in various domains	K3
CO5	Solve real time problems using Java	K5

### Mapping of CO with PO and PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	3	2	1	1	2	2	2	2	2
CO2	3	2	3	1	1	3	3	2	3	2
CO3	3	3	3	2	2	3	3	2	3	2
CO4	3	2	3	2	2	3	3	2	3	2
CO5	3	3	3	2	2	3	3	2	2	3

“1” – Slight (Low) Correlation “2” – Moderate (Medium) Correlation  
“3” – Substantial (High) Correlation “-” indicates there is no correlation.

## Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<b>Fundamentals of Object-Oriented Programming:</b> Basic Concepts of Object-Oriented Programming - Benefits and Applications of OOP. <b>Java Evolution:</b> Java Features - Java Environment - <b>Overview of Java Language:</b> Java Program Structures, Statements – Implementing A Java Program – Java Virtual Machine –. <b>Constants, Variables and Data Types:</b> Constants- Variables – Data Types – Declaration of Variables – Giving Values to Variables – Scope of Variables – Symbolic Constants- Type Casting- Getting Values of Variables.	15	CO1, CO2, CO3	K1, K2, K3, K4
II	<b>Operators and Expressions:</b> Introduction - Arithmetic Operators- Relational Operator - Logical Operator - Assignment Operator-increment and decrement Operator-Conditional Operator - Bitwise Operator- Special Operator - <b>Decision Making and Branching:</b> Introduction - Decision making with if statement-Simple if statement -The if ..else Statement-Nesting of if ...else statements- The switch statement - The Conditional Operator(?:Operator) - <b>Decision Making and Looping :</b> While, Do, For Statement, Jump In Loops, Return Statement.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	<b>Classes, Objects and Methods:</b> Defining A Class – Fields and Methods Declaration - Creating Objects – Accessing Class Members – Constructors – Method Overloading – Static Members – Nesting of Methods – Inheritance: Extending A Class – Overriding Methods – Final Variables, Methods and Classes – Abstract Methods and Classes – Visibility Control. <b>Arrays, Strings and Vectors:</b> Creating Arrays – One and two Dimensional Arrays Strings – Vectors. <b>Interfaces: Multiple Inheritance:</b> Introduction - Defining Interfaces - Extending Interfaces- Implementation Interfaces - Accessing Interfaces Variables.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	<b>Packages:</b> Introduction - Java Packages - Using System Packages-Naming conventions - Creating packages - Accessing a package - Using a Package - Adding a class to a package - <b>Multithreaded Programming:</b> Creating Threads – Extending the Thread Class – Thread- Life Cycle of Thread-Using Thread Method-Thread Priority – Synchronization – <b>Managing Errors and Exceptions:</b> Introduction - Types of Errors - Exceptions-Syntax of Exception Handling code-Multiple Catch Statements.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
V	<b>Graphics Programming using AWT, Swing and Layout Manager:</b> The Graphics Class- Lines and Rectangles- Circles and Ellipses-Drawing Arcs - Drawing Polygons – Introduction to AWT Package – Window Fundamentals – Layout Managers – Introduction to Swing Package – Components and Containers – AWT versus Swing - <b>Database Connectivity:</b> Introduction – JDBC Architecture – Discussion with Example – Overview of JDBC Components.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<b>UNIT VI - Self Study for Enrichment</b> <b>(Not to be included for External Examination)</b> Comment Line Arguments – Enumerated Types - Finalizer Methods - <b>Applet Programming:</b> Building Applet Code - Applet Life Cycle - Creating and Executable Applet – Designing a Web Page using Applet – <b>Managing Input/Output Files in Java:</b> Stream Classes – Byte Stream Classes – Character Stream Classes – Creation of Files – Reading/Writing Characters – Reading/Writing bytes.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

## **Textbook**

E. Balagurusamy,(2019). "Programming with JAVA", 6<sup>th</sup> Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi.

## **References**

1. S.Sagayaraj, R.Denis, P.Karthik and D.Gajalakshmi,(2017).“Java programming”,Universities Press.
2. Schildt Herbert,(2011).“Java :The Complete Reference”, 8<sup>th</sup> Edition Tata McGraw-Hill.
3. C.Muthu, (2008).”Programming with JAVA”, Second Edition, McGraw HillEducation
4. Ken Arnold gosling and Davis Holmen,(2005). ”The JAVA Programming Language”,4<sup>th</sup> Edition, Addison Wesley Pearson Education Publication.

## **Web References**

1. <https://www.javatpoint.com/java-tutorial>
2. <https://www.guru99.com/java-tutorial.html>
3. <https://www.w3schools.com/java/>

## **Pedagogy**

Chalk and Talk, PPT, Discussion, Assignment, Demo, Quiz and Seminar.

## **Course Designer**

Ms. A. Jabeen, Assistant Professor, Department of Computer Applications.

Semester II	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS./WEEK	CREDITS
22UCS2CC2P	JAVA PROGRAMMING (P)	CORE	3	3

### Course Objective

- To demonstrate the basic programming components of Java
- To learn how to apply the object oriented concepts in Java to develop stand-alone applications
- To design and develop GUI applications with appropriate database connectivity

### Course Outcomes and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Demonstrate and Implement the fundamentals of Java programming concepts	K2,K3
CO2	Analyze the problem and develop skills on identifying appropriate Programming constructs like looping, branching and functions	K3,K4
CO3	Examine the problem and create a reusable program by combining the features of Java such as Classes, Objects, Packages, Interfaces and Exception handling	K4,K6
CO4	Analyze the complexity of problem in real world and design an event driven and web based interactive programs using Applets	K4,K6
CO5	Build applications with database connectivity to mimic the real world scenarios	K6

### Mapping of CO with PO and PSO

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	2	3	3	2	2	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	3	3	3
CO4	3	3	3	3	3	2	3	2	3	3
CO5	3	3	3	3	3	2	3	3	3	3

“1”-Slight (Low) Correlation  
“3”-Substantial (High) Correlation

“2”-Moderate (Medium) Correlation  
“-”-indicates there is no Correlation.

### Exercises:

1. Class and Objects
2. Decision Making using Control Statements and Loop Statements
3. Method Overloading and Method Overriding
4. Inheritance
5. Interface
6. Package
7. Multithread
8. Exception Handling

9. GUI using Swing
10. Database Connectivity using JDBC

**Web References:**

1. <http://docs.oracle.com/javase/tutorial/java/>
2. <http://www.java2s.com/Tutorial/Java/CatalogJava.htm>
3. <http://www.javatpoint.com/java-swing>
4. <http://way2java.com/java-versions-2/jdk-1-8-features/>
5. <https://www.w3schools.com/java/>
6. <https://www.tutorialspoint.com/java/>

**Pedagogy:**

Power Point Presentations, Demo by e-Contents tutorials

**Course Designer:**

Ms.N.Girubagari



Semester II	Internal Marks:40		External Marks:60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS./WEEK	CREDITS
22UCS2CC3P	DATA VISUALIZATION (P)	CORE	3	3

### Course Objective

- To perform basic calculations and formatting on Data
- To expose the visual representation methods and techniques that increase the understanding of complex data
- To gain knowledge in good design practices for visualization of data

### Course Outcomes and Cognitive Level Mapping

CO Number	CO Statement	Cognitive Level
CO1	Demonstrate the use of basic Functions, Methods and Formatting	K2
CO2	Identify the different Models for data analysis	K3
CO3	Analyze the data using Graph Function	K4
CO4	Construct the data analysis report with proper validation	K5
CO5	Build Dashboard for data visualization	K6

### Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	3	2	3	2	3	1	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	2	3	2	3	1	3	3
CO4	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3

“1”–Slight(Low) Correlation

“3”–Substantial (High) Correlation

“2”–Moderate(Medium)Correlation

“-”indicates there is no Correlation.

**Exercises:**

1. Using Microsoft Excel
  - a. Creation and Formatting
  - b. Functions and Formulas
  - c. Graphs
  - d. Lookup and Reference Functions
  - e. Data Validation
  - f. Pivot table
  - g. Data analysis report generation
  - h. Working with multiple worksheets
2. Using Power BI
  - a. Basic Reports
  - b. Filtering Data
  - c. Charts
  - d. Data Analysis
  - e. Book marks
  - f. Dashboard Creation
3. Data visualization using Tableau

**Web References:**

1. [https://www.tutorialspoint.com/excel\\_data\\_analysis/](https://www.tutorialspoint.com/excel_data_analysis/)
2. <https://www.udemy.com/course/data-visualization-in-excel-for-business-professionals/>
3. <https://www.w3schools.com/googlesheets/>
4. <https://www.smartsheet.com/how-create-dashboard-excel>
5. <https://www.javatpoint.com/tableau>

**Pedagogy:**

Demo by e-Contents

**Course Designer:**

Ms.N.Agalya

**FIRST ALLIED COURSE –III (AC)**  
**OPERATIONS RESEARCH**

(For B.Sc Computer Science, Computer Science with Cognitive Systems, BCA & B.Sc Information Technology)

(2022-2023 and Onwards)

Semester II	Internal Marks:25		External Marks:75	
COURSE CODE	COURSE TITLE	CATEGORY	Hrs/Week	CREDITS
22UCS2AC3/ 22UCG2AC3/ 22UCA2AC3/ 22UIT2AC3/	OPERATIONS RESEARCH	ALLIED	4	3

**Course Objective**

- **Understand** the various features of Operations research.
- **Analyze** the optimum solutions using Operations research.
- **Explore** the concepts of Operations research in real life problems.

**Course Outcomes**

**Course Outcome and Cognitive Level Mapping**

CO Number	CO Statement	Cognitive Level
	On the successful completion of the course, students will be able to	
CO1	Define the various techniques of Operations research.	K1
CO2	Illustrate the various notions in the respective streams.	K2
CO3	Identify the different terminologies of Operations research	K3
CO4	Analyze the solutions of mathematical problem using specific techniques.	K4
CO5	Simplify the optimum solutions of a mathematical problem.	K4

**Mapping of CO with PO and PSO**

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	2	3	3	3	2	3
CO2	3	2	3	3	2	3	3	3	3	2
CO3	3	2	3	3	2	3	2	3	2	2
CO4	3	2	2	2	2	3	3	2	3	2
CO5	3	2	3	2	2	3	3	3	2	2

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

## Syllabus

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	<p><b>Operations Research</b> Introduction-Origin and Development of O.R.- Nature and Features of O.R.- Scientific Method in O.R.- Modelling in Operations Research - Advantage and Limitation of Models- General Solution Methods for O.R. Models- Methodology of Operations Research- Operations Research and Decision Making</p> <p><b>Linear Programming Problem- Mathematical Formulation</b> Introduction-Linear programming Problem-Mathematical Formulation of the problem -Illustrations on Mathematical Formulation of LPPs.(simple problems only)</p> <p><b>Linear programming problem-graphical Solution and Extension</b> Introduction- Graphical Solution Method- General Linear Programming Problem- Canonical and Standard Forms of LPP.</p>	12	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4
II	<p><b>Linear Programming Problem-Simplex Method</b> Introduction-Fundamental Properties of Solutions- The computational Procedure- The Simplex Algorithm-Use of Artificial Variables-Big M method.(simple problems only).</p>	12	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4
III	<p><b>Transportation problem</b> Introduction-LP Formulation of the Transportation Problem- Existence of Solution in T.P-TheTransportation Table-Loops in Transportation Table-Solution of a Transportation Problem-Finding an Initial Basic Feasible Solution-Test for Optimality-Economic interpretation of <math>u_j</math>'s and <math>v_j</math>'s - Degeneracy in Transportation Problem-Transportation Algorithm (MODI method), (simple problems only).</p> <p><b>Assignment Problem</b> Introduction-Mathematical Formulation of the Problem- Solution Methods of Assignment Problem-Special Cases in Assignment Problems(simple problems only).</p>	12	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4
IV	<p><b>Sequencing problem</b> Introduction-Problem of Sequencing-Basic Terms Used in Sequencing- Processing <math>n</math> Jobs through Two Machines- Processing <math>n</math> Jobs through <math>k</math> Machines(problems only).</p>	12	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4
V	<p><b>Network Scheduling by PERT/CPM</b> Introduction- Network: Basic Components- Logical Sequencing- Rules of Network Construction-Concurrent Activities - Critical Path Analysis -</p>	12	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4

	Probability Considerations in PERT.			
VI	<b>Self-Study for Enrichment</b> <b>(Not included for End Semester Examination)</b> Application of Operations Research. – Two-Phase method – The Travelling Salesman problem – Processing 2 Jobs through $k$ Machines –. Inventory Models(without shortage)	-	CO1,CO2, CO3,CO4, CO5	K1,K2,K3, K4

### Text Books

1. Kanti Swarup, P.K. Gupta, Manmohan.(2019). *Operations research, Sultan Chand Publications.*

### Chapters and Sections

- UNIT-I Chapter 1: Sections 1:1 – 1:9  
 Chapter 2: Sections 2:1 – 2:4  
 Chapter 3: Sections 3:1 – 3:5
- UNIT II Chapter 4: Sections 4:1 – 4:4
- UNIT-III Chapter 10: Sections 10:1 – 10:3, 10:5, 10:6, 10:8 – 10:13  
 Chapter 11: Sections 11:1 – 11:4
- UNIT-IV Chapter 12: Sections 12:1 – 12:5
- UNIT-V Chapter 25: Sections 25:1 – 25:7

### Reference Books

1. Hamdy A.Taha (2017), *Operations Research An Introduction*, Pearson India Education services PVT Ltd.
2. Premkumar Gupta, Hira D.S.(2004), *Operations Research*, S.Chand & Company Ltd, New Delhi.
3. Chandrasekhara Rao.K,Shanti Lata Mishra(2008), *Operations Research*, Narosa Publishing House PVT Ltd, New Delhi.

### Web References

- 1.<https://www.britannica.com/topic/operations-research>
- 2.<https://byjus.com/maths/linear-programming/>
- 3.<https://www.gatexplore.com/transportation-problem-study-notes/>
- 4.<https://youtu.be/rowWM-MijXU>
- 5.<https://youtu.be/TQvxWaQnrqI>
- 6.[https://youtu.be/RTX-ik\\_8i-k](https://youtu.be/RTX-ik_8i-k)
- 7.<https://youtu.be/s5KZw1EpBEo>

### Pedagogy

Power point presentation, Group discussion, Seminar, Assignment.

### Course Designers

- 1.Dr. V. Geetha
2. Dr. S. Sasikala

<b>Semester :II</b>	<b>Internal Marks: 100</b>			
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>HRS/WEEK</b>	<b>CREDITS</b>
22UGEVS	ENVIRONMENTAL STUDIES	ABILITY ENHANCEMENT COMPULSORY COURSE	2	2

## Course Objective

To train the students to get awareness about total environment and its related problems and to make them to participate in the improvement and protection of the environment.

## Course Outcome and Cognitive Level Mapping

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

CO Number	CO Statement	Cognitive Level
CO1	Outline the nature and scope of environmental studies	K1, K2
CO2	Illustrate the various types of natural resources and its importance.	K2
CO3	Classify various types of ecosystem with its structure and function.	K2, K3
CO4	Develop an understanding of various types of pollution and biodiversity.	K3
CO5	List out the various types of social issues related with environment and explain protection acts	K4, K5

## Mapping of CO with PO and PSO

Cos	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	3	2	2	3	2	3
CO2	3	3	2	3	3	3	2	3	3	3
CO3	2	3	3	2	3	3	3	3	3	2
CO4	2	3	3	3	2	3	2	3	3	3
CO5	3	3	2	3	3	3	3	2	3	3

“1” – Slight (Low) Correlation

“2” – Moderate (Medium) Correlation

“3” – Substantial (High) Correlation

“-“ indicates there is no correlation

# Syllabus

UNIT	CONTENT	HOURS	COS	COGNITIVE LEVEL
I	Introduction to environmental studies Definition, scope and importance. Need for public awareness	06	CO1, CO2, CO3, CO4	K1, K2, K3,
II	<p><b>Natural Resources: Renewable and non-renewable resources:</b></p> <p>a. Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.</p> <p>b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.</p> <p>c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.</p> <p>d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p> <p>e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.</p> <p>f. Land resources: Land as resources, land degradation, man induced Landslides, soil erosion and desertification.</p> <p>g. Role of an individual in conservation of natural resources.</p>	06	CO1, CO2, CO3, CO4	K1, K2, K3
III	<p><b>Ecosystems</b></p> <p>Concept, Structure and function of an ecosystem. Producers, consumers and decomposers</p> <p>Energy flow in the ecosystem and Ecological succession.</p> <p>Food chains, food webs and ecological pyramids</p> <p>Introduction, types, characteristic features, structure and function of the following ecosystem: -Forest ecosystem, Grassland ecosystem and Desert ecosystem, Aquatic ecosystems, (ponds, streams, lakes, rivers, oceans, estuaries)</p>	06	CO1, CO2, CO3, CO4	K1, K2, K3
IV	<p><b>Biodiversity and Environmental Pollution</b></p> <p>Introduction, types and value of biodiversity. India as a mega diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Definition, Causes, effects and control measures of:</p>	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

	<p>a. Air Pollution  b. Water Pollution  c. Soil Pollution  d. Noise pollution  e. Nuclear hazards</p> <p>Solid waste Management: Causes, effects and control measures of urban and industrial wastes.  E-Waste Management: Sources and Types of E-waste. Effect of E-waste on environment and human body. Disposal of E-waste, Advantages of Recycling E-waste.  Role of an individual in prevention of pollution.  Disaster management: floods, earthquake, cyclone and landslides.</p>			
V	<p><b>Social Issues and the Environment</b>  Water conservation, rain water harvesting, watershed management. Climate change, global warming, acid rain, ozone layer depletion, Wasteland reclamation.  <b>Environment Protection Act</b>  Wildlife Protection Act. Forest Conservation Act. Population explosion – Family Welfare Programmes Human Rights - Value Education. HIV/ AIDS - Women and Child Welfare. Role of Information Technology in Environment and human health.</p>	06	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
VI	<p><b>Self-Study for Enrichment</b>  (Not to be included for End Semester Examination)  Global warming – climate change – importance of ozone – Effects of ozone depletion. Biogeography – history, ecology and conservation. International laws and policy</p>		CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

## References

1. Beard, J.M. 2013. Environmental Chemistry in Society (2nd edition). CRC Press.
2. Girard, J. 2013. Principles of Environmental Chemistry (3rd edition). Jones & Bartlett.
3. Brebbia, C.A. 2013. Water Resources Management VII. WIT Press.
4. Pandit, M.K. & Kumar, V. 2013. Land use and conservation challenges in Himalaya: Past, present and future. In: Sodhi, N.S., Gibson, L. & Raven, P.H. Conservation Biology: Voices from the Tropics. pp. 123-133. Wiley-Blackwell, Oxford, UK (file:///Users/mkpandit/ Downloads /Raven%20et%20al.%202013.%20CB%20Voices%20from%20Tropics%20(2).pdf) .
5. Hites, R.A. 2012. Elements of Environmental Chemistry (2nd edition). Wiley & Sons.
6. Harnung, S.E. & Johnson, M.S. 2012. Chemistry and the Environment. Cambridge University Press.
7. Boeker, E. & Grondelle, R. 2011. Environmental Physics: Sustainable Energy and Climate Change. Wiley.
8. Forinash, K. 2010. Foundation of Environmental Physics. Island Press.
9. Evans, G.G. & Furlong, J. 2010. Environmental Biotechnology: Theory and Application (2nd edition). Wiley-Blackwell Publications.
10. Williams, D. M., Ebach, M.C. 2008. Foundations of Systematics and Biogeography. Springer
11. Pani, B. 2007. Textbook of Environmental Chemistry. IK international Publishing House.
12. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.



## **Pedagogy**

Chalk and talk, PPT, Discussion, Assignment, Quiz, Seminar

## **Course Designer**

Dr.B.Thamilmaraiselvi

Ability Enhancement Compulsory Course II (AECC) : Environmental Studies (22UGEVS) Assessment

Rubrics for 100 Marks

1. Documentary (or) Poster Presentation (or) Elocution-25 Marks
2. Quiz (or) MCQ Test-25 Marks
3. Album Making (or) Case study on a topic (or) Field Visit -25 Marks
4. Essay Writing (or) Assignment (Minimum 10 pages) -25 Marks

There will be no End Semester Examination for this course. However, the subject teacher will evaluate the above mentioned components based on the performance of the students and submit the marks out of 100 (in the format to be supplied by the COE) with the approval of the concerned Head of the Department to the COE along with CIA marks of other courses.

## INNOVATION & ENTREPRENEURSHIP

<b>Semester II</b>	<b>Internal marks:40</b>		<b>External marks: 60</b>	
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>Hrs/week</b>	<b>CREDITS</b>
<b>22UGIE</b>	<b>INNOVATION &amp; ENTREPRENEURSHIP</b>	<b>Ability Enhancement Compulsory Course -III</b>	<b>2</b>	<b>1</b>

### Course Objective

- The course is designed to motivate the students in Entrepreneurship with innovative ideas and build interest in Venture Creation.

### Course Outcome and Cognitive Level Mapping

The students will be able to

CO	CO Statement	Knowledge Level
CO 1	Identify Self-Entrepreneurial traits and passion leads.	K3
CO 2	Discover problem solving opportunities and generate ideas	K3
CO 3	Analyse the process of design thinking	K4
CO 4	Develop Business Model canvas for the idea generated	K5
CO 5	Validate the business idea by creating Capstone project	K6

### Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1										
CO2										
CO3										
CO4										
CO5										

“1” – Slight (Low) Correlation – “2” – Moderate (Medium) Correlation –

“3” – Substantial (High) Correlation – “-” indicates there is no correlation.

## SYLLABUS

UNIT	CONTENT	HOURS	CO'S	COGNITIVE LEVELS
I	<p><b><u>Entrepreneurship &amp; Intrapreneurship</u></b></p> <p>Importance of Entrepreneurship Development-The entrepreneurial mind set – Attributes and Characteristics of a successful entrepreneur.</p> <p>Intrapreneurship- Importance- Attributes, Contribution and Characteristics of a successful Intrapreneur- Types of Intrapreneurs.</p> <p><b>Self-Discovery- Learnings from famous company cases that promote entrepreneurship and Intrapreneurship. (Activity)</b></p>	6	<p>CO1</p> <p>CO2</p> <p>CO3</p> <p>CO4</p> <p>CO5</p>	<p>K3</p> <p>K4</p> <p>K5</p>
II	<p><b><u>Entrepreneurial Skill Sets</u></b></p> <p>Significance of Entrepreneurship skills- Business Management Skill- Decision making skills- Principles of Effectuation- Analytical &amp; Problem-solving skill- Critical thinking skill- Lateral thinking skill- Factors associated with lateral thinking along with examples.</p> <p><b>Opportunity Discovery- Identify problems worth solving through JTBD method (Activity)</b></p>	6	<p>CO1</p> <p>CO2</p> <p>CO3</p> <p>CO4</p> <p>CO5</p>	<p>K3</p> <p>K4</p> <p>K5</p>

<b>III</b>	<b>Design Thinking &amp; Innovation</b>  Innovation & Creativity- Role in Industry and Organizations- Dynamics of Creative Thinking-Process of Design Thinking- Implementing the Process in Driving Innovation through scientific technologies and Non technology process.  <b>Business Idea Generation – Build your own Idea Bank with Innovative Approaches (Activity)</b>	<b>6</b>	<b>CO1</b>  <b>CO2</b>  <b>CO3</b>  <b>CO4</b>  <b>CO5</b>	<b>K3</b>  <b>K4</b>  <b>K5</b>
<b>IV</b>	<b>Crystallising the business Idea</b>  Customer Discovery- Identification of customer segments-Drafting of Value Proposition Canvas with a venture creation Idea. Basics of Business Model and LEAN Approach, Blue Ocean Strategy Approach.  <b>Crafting business model for a venture using the Lean Canvas – (Activity)</b>	<b>6</b>	<b>CO1</b>  <b>CO2</b>  <b>CO3</b>  <b>CO4</b>  <b>CO5</b>	<b>K3</b>  <b>K4</b>  <b>K5</b>
<b>V</b>	<b>Start -up Business Plan</b>  Presentation of Capstone project; Validation Analysis; Pre-incubation and Incubation stages to develop a start-up ecosystem.	<b>6</b>	<b>CO1</b>  <b>CO2</b>  <b>CO3</b>  <b>CO4</b>  <b>CO5</b>	<b>K3</b>  <b>K4</b>  <b>K5</b>  <b>K6</b>
<b>VI</b>	<b>Self study for enrichment:</b> (Not to be included for External examination)  Case study analysis on Entrepreneurship		<b>CO1</b> <b>CO2</b> <b>CO3</b> <b>CO4</b> <b>CO5</b>	<b>K3</b>  <b>K4</b>  <b>K5</b>

**Textbooks:**

1. Elias G.Carayannis, Elbida.D.Samra (2015), Innovation and Entrepreneurship,
2. Peter.F. Drucker (2006), Innovation and Entrepreneurship, Harper Publications

**Reference books:**

1. John R.Bessant, Joe Tidd (2015), Innovation and Entrepreneurship, Wiley Publictaions
2. Mike Kennard (2021), Innovation and Entrepreneurship, Routledge, Taylor and Frnaxis

**Web References:**

1. <https://innovation-entrepreneurship.springeropen.com/>
2. <https://www.worldcat.org/title/innovation-and-entrepreneurship-practice-and-principles/oclc/11549089/lists>

**Pedagogy:**

e- Content modules, Activity worksheet, Case Studies

**Course Designer:**

Dr.R.Subha, Assistant Professor, Innovation ambassador, Department of Chemistry

Dr.S.Sowmya,Assistant Professor, Innovation ambassador, Department of Commerce

**ABILITY ENHANCEMENT COMPULSORY COURSE III-  
INNOVATION AND ENTREPRENEURSHIP**

**Assessment Rubrics for 100marks**

S.No	Particulars	Marks
1	Self Analysis / Preparation of Self Identification Report / Case study presentation	20
2	Identification of Problem / Innovative practice/ Business plan report	20
3	Lean Canvas / Value Proposition Model / Prototype	20
4	VIVA VOCE  a. Novelty of Business Idea  b. Commercial Scalability  c. Pitching Presentation	  20  10  10
	<b>TOTAL</b>	<b>100</b>

There will be no End Semester Examination for this Course. The subject teacher will make the assessment of students performance based on the above mentioned components and an internal VIVA VOCE will be conducted by the Institution Innovation Ambassadors of Institution Innovation Council, Ministry of Education. Marks will be awarded and submitted to CoE in the Prescribed format specified by the Controller of the examination approved by the Head of respective Departments.