CAUVERY COLLEGE FOR WOMEN(AUTONOMOUS)
Nationally Accredited with 'A' Grade by NAAC
TIRUCHIRAPPALLI

PG AND RESEARCH DEPARTMENT OF COMPUTER SCIENCE

B.Sc. COMPUTER SCIENCE

SYLLABUS

2024 -2025 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)

PEOs	Statements
PEO1	**LEARNING ENVIRONMENT** 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.
PEO2	**ACADEMIC EXCELLENCE** 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.
PEO3	**EMPLOYABILITY** 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.
PEO4	**PROFESSIONAL ETHICS AND SOCIAL RESPONSIBILITY** 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.
PEO5	**GREEN SUSTAINABILITY** 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

PO NO.	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
PO 1	**ACADEMIC SKILLS & SOCIAL RESPONSIBILITY** Apply Computing, Mathematical and Scientific Knowledge in Various disciplines by understanding the concerns of the society.
PO 2	**CRITICAL THINKING AND INNOVATIVE PROGRESS** Design the software applications with varying intricacies using programming languages for innovative learning in techno world to meet the changing demands.
PO 3	**PERSONALITY DEVELOPMENT** Perceive Leadership skills to accomplish a common goal with effective communication and understanding of professional, ethical, and social responsibilities.
PO 4	**LIFELONG LEARNING** Identify resources for professional development and apply the skills and tools necessary for computing practice to gain real life experiences.
PO 5	**CREATIVITY AND HOLISTIC APPROACH** 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

PSO NO.	The students of B.Sc. Computer Science will be able to	POs Addressed
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

Semester	Part	Course	Course Title	Course Code	Inst. Hrs. / week	Credits	Exam Hrs.	Exam Marks Int	Exam Marks Ext	Total
I	I	Language Course-I (LC)	பொதுத்தமிழ்– I	23ULT1	6	3	3	25	75	100
			Hindi ka Samanya Gyanaur Nibandh	23ULH1						
			Poetry, Grammar and History of Sanskrit Literature	23ULS1						
			Foundation Course:Paper I - French I	23ULF1						
	II	English Language Course -I (ELC)	General English -I	23UE1	6	3	3	25	75	100
	III	Core Course – I (CC)	Programming in C	24UCS1CC1	5	5	3	25	75	100
		Core Practical - I (CP)	C Programming (P)	24UCS1CC1P	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-Value Education	23UGVE	2	2	-	100	-	100
		Total			**30**	**22**				**700**
II	I	Language Course-II (LC)	பொதுத்தமிழ்– II	23ULT2	6	3	3	25	75	100
			Hindi Literature & Grammar - II	22ULH2						
			Prose, Grammar and History of Sanskrit Literature	23ULS2						
			Basic French - II	22ULF2						
	II	English Language Course –II (ELC)	General English- II	23UE2	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)	23UCS2CC3P	2	2	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
		SWAYAM	As per UGC Recommendation							
		Total			**30**	**22**				**800**

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

Course	Internal Marks	External Marks
Theory	25	75
Practical	40	60

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)

Semester: I	Internal Mark: 25		External Mark: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS / WEEK**	**CREDITS**
23UIT1CC1/ 24UCS1CC1	**PROGRAMMING IN C**	**CC**	**5**	**5**

Course Objectives

- To familiarize the students with the understanding of code organization
- To improve the programming skills
- Learning the basic programming constructs.

Course Outcomes and Cognitive Level Mapping

CO Number	Course Outcome	Cognitive Level
CO1	Outline the fundamental concepts of C programming languages, and its features	K1
CO2	Demonstrate the programming methodology	K2
CO3	Identify suitable programming constructs for problem solving	K3
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement	K4
CO5	Evaluate the program performance by fixing the errors	K5

Mapping of CO with PO and PSO

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
CO1	2	2	3	2	1	2	2	2	3	2
CO2	3	2	3	2	2	3	3	2	3	2
CO3	3	3	3	2	2	3	3	2	3	3
CO4	3	2	3	2	3	2	2	2	3	3
CO5	3	3	3	2	3	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	**Studying Concepts of Programming Languages**-Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
II	**Decision Making and Branching:** Decision making with If, simple IF, IF ELSE, nested IF ELSE , ELSE IF ladder, switch, GOTO statement. Decision Making and Looping: While, Do-While, For, Jumps in loops. Arrays - Character Arrays and Strings	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
III	**User Defined Functions:** Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
IV	**Structures and Unions:** Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
V	**Pointers:** Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions-Memory model-File Management in C	15	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5
VI	**Self Study for Enrichment** **(Not included for End Semester Examinations)** Algorithm- Flowchart- Develop algorithms for real time scenario- Simple expressions- Conversion programs-swapping numbers (with and without using temporary variable). Programs for checking eligibility-Triangle formation-Sum of series-Array manipulations (Sorting, searching, insert, delete and merging)-String handling programs-Dynamic memory management using pointers-Employee pay bill preparation, Student mark list using Files.	-	CO1 CO2 CO3 CO4 CO5	K1 K2 K3 K4 K5

Text Books

1. Robert W. Sebesta, (2012), ―Concepts of Programming Languages‖, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)
2. E. Balaguruswamy, (2010), ―Programming in ANSI C‖, Fifth Edition, Tata McGraw Hill Publications.

References

1. Ashok N. Kamthane, Amit Ashok Kamthane(2015). Programming in C, 3rd Edition, Pearson India Education Services Pvt. Ltd.
2. Byron Gottfried, (2010), ―Programming with C‖, Schaums Outline Series, Tata McGraw Hill Publications

Web References

1. https://www.learn-c.org/
2. https://www.cprogramming.com/
3. https://www.tutorialspoint.com/cprogramming/index.html
4. http://www.programiz.com/c-programming
5. http://www.programmingsimplified.com/c-program-examples
6. https://archive.nptel.ac.in/courses/106/104/106104128/

Pedagogy

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

Course Designer

Dr. M. Anandhi, Associate Professor, Department of Information Technology.

Semester: I	Internal Mark: 40		External Mark: 60	
COURSE CODE	COURSE TITLE	CATEGORY	HOURS / WEEK	CREDITS
23UIT1CC1P / 24UCS1CC1P	C PROGRAMMING (P)	CP	3	3

Course Objectives

- The Course aims to provide exposure to problem-solving through C programming
- It aims to train the student to the basic concepts of the C -Programming language
- Apply different concepts of C language to solve the problem

Course Outcomes and Cognitive Level Mapping

CO Number	Course Outcome	Cognitive Level
CO1	Demonstrate the understanding of syntax and semantics of C programs.	K1
CO2	Identify the problem and solve using C programming techniques.	K2
CO3	Identify suitable programming constructs for problem solving.	K3
CO4	Analyze various concepts of C language to solve the problem in an efficient way.	K4
CO5	Develop a C program for a given problem and test for its correctness.	K5

Mapping of CO with PO and PSO

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

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

Syllabus

1. Programs using Input/ Output functions
2. Programs on conditional structures
3. Command Line Arguments
4. Programs using Arrays
5. String Manipulations
6. Programs using Functions
7. Recursive Functions
8. Programs using Pointers
9. Files
10. Programs using Structures & Unions

Text Book

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill, 2010.

Reference Books

1. Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018.
2. Kernighan and Ritchie, The C Programming Language, Second Edition, Prentice Hall, 1998.
3. Yashavant Kanetkar, Let Us C, Eighteenth Edition, BPB Publications, 2021

Web References

1. https://www.tutorialspoint.com/cprogramming
2. https://www.javatpoint.com/c-programming-language-tutorial
3. https://www.w3schools.in/category/c-tutorial

Course Designer

Dr. M. Anandhi, Associate Professor, Department of Information Technology.

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 On the successful completion of the course, students will be able to	Cognitive Level
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	COGNITIV ELEVEL
I	**Matrices** 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 *m* homogeneous linear equations in *n* unknowns – System of non-homogeneous linear equations – Eigen values and Eigenvectors – Similar matrices – Cayley-Hamilton Theorem (proof not needed) – Simple applications only	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Differentiation** Maxima and Minima (Problems Only) –Points of inflexion. **Partial differentiation** Functions of function rule – Total Differential Coefficient – A Special case – Implicit Functions – Homogeneous functions – Euler's Theorem (proof not needed) – Simple problems only.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Integration** Integration of Rational algebraic functions – Rule (a) – Rule (b): Type i:$\int \frac{dx}{ax^2+bx+c}$, Type ii: $\int \frac{lx+m}{ax^2+bx+c}\, dx$ – Integration of Irrational functions : Case (ii) Integration of the form $\int \frac{px+q}{\sqrt{ax^2+bx+c}}$ – Type $\int \frac{dx}{a+b\cos x}$ – Properties of definite integrals.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Differential Equations** Linear Differential Equation with constant coefficients – The Operators D and D^{-1} – Particular Integral – Special methods of finding P.I.: X is of the form (a) $e^{\alpha x}$ (b) $\cos\alpha x$ or $\sin\alpha x$, where α is a constant (c) x^m (a power of x), m being a positive integer (d) $e^{\alpha x}V$, where V is any function of x.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Graph Theory** Introduction – Definition of Graphs – Applications of Graphs – Finite and infinite graphs – Incidence and Degree – Isolated Vertex, Pendant Vertex and Null Graph. **Path and Circuits** Isomorphism – Subgraphs – Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components – Euler graphs.	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**Self-Study for Enrichment** **(Not included for End Semester Examination)** Symmetric matrix – Skew symmetric matrix – Hermitian and skew Hermitian matrices Concavity and Convexity– Integration by parts – Linear equation – Hamiltonian Paths and Circuits.	-	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4

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

Web links

1. https://youtu.be/rowWM-MijXU
2. https://youtu.be/TQvxWaQnrqI
3. https://youtu.be/pvLj1s7SOtk
4. https://youtu.be/Gxr3AT4NY_Q
5. https://youtu.be/xlbbefbYLzg
6. https://youtu.be/b0RJkIBhfEM
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)
(2022-2023 and Onwards)

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**	

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 On the successful completion of the course, students will be able to	Cognitive Level
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	**Solution of Algebraic & Transcendental Equations:** Introduction – The Bisection Method – The Iteration Method – Newton-Raphson Method (Problems Only) **Interpolation:** Finite Differences: Forward Differences, Backward Differences – Newton's Formulae for Interpolation – Interpolation with unevenly spaced Points: Lagrange's Interpolation formula	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
II	**Numerical Integration:** Numerical Integration: Simpson's 1/3-Rule – Simpson's 3/8-Rule (proof not needed). **Linear Systems of Equations:** Solution of Linear Systems–Direct Methods: Gaussian Elimination Method – Solutions of Linear Systems – Iterative Methods (Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
III	**Numerical solution of Ordinary Differential Equations:** Introduction – Euler's Method – Modified Euler's Method – Runge-Kutta Methods – Predictor - Corrector Methods : Adams-Moulton Method	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
IV	**Measures of Central Tendency:** Arithmetic Mean – Median – Mode – Geometric Mean – Harmonic Mean. **Measures of Dispersion:** Mean Deviation – Standard Deviation (Simple Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
V	**Correlation:** 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). **Linear Regression:** Introduction – Linear Regression (Derivation not needed and Simple Problems Only)	12	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4
VI	**Self Study for Enrichment:** **(Not included for End Semester Examination)** The method of False Position & Central Differences - Trapezoidal rule - Solution by Taylor's Series and Milne's Method - Range – Quartile Deviation - Rank Correlation (Repeated Ranks).	-	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 Link

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

Peadogogy

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

Course Designers

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

Semester II	Internal Marks: 25		External Marks: 75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/ 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

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

CO Number	CO Statement On the successful completion of the course, the students will be able to	Cognitive Level
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

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	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.

UNIT	CONTENT	HOURS	COs	COGNITIVE LEVEL
I	**Fundamentals of Object-Oriented Programming:** Basic Concepts of Object-Oriented Programming - Benefits and Applications of OOP. **Java Evolution:** Java Features - Java Environment - **Overview of Java Language:** Java Program Structures, Statements – Implementing A Java Program – Java Virtual Machine –. **Constants, Variables and Data Types:** 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	**Operators and Expressions:** Introduction - Arithmetic Operators- Relational Operator - Logical Operator - Assignment Operator-increment and decrement Operator-Conditional Operator - Bitwise Operator- Special Operator - **Decision Making and Branching:** 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) -**Decision Making and Looping :** While, Do, For Statement, Jump In Loops, Return Statement.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
III	**Classes, Objects and Methods**: 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. **Arrays, Strings and Vectors**: Creating Arrays – One and two Dimensional Arrays Strings – Vectors. **Interfaces: Multiple Inheritance:** Introduction - Defining Interfaces - Extending Interfaces- Implementation Interfaces - Accessing Interfaces Variables.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5
IV	**Packages**: Introduction - Java Packages - Using System Packages- Naming conventions - Creating packages - Accessing a package - Using a Package - Adding a class to a package - **Multithreaded Programming:** Creating Threads – Extending the Thread Class – Thread- Life Cycle of Thread-Using Thread Method-Thread Priority – Synchronization – **Managing Errors and Exceptions:** 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	**Graphics Programming using AWT, Swing and Layout Manager:** 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 - **Database Connectivity**: Introduction – JDBC Architecture – Discussion with Example – Overview of JDBC Components.	15	CO1, CO2, CO3, CO4, CO5	K1, K2, K3, K4, K5

VI	**UNIT VI** - **Self Study for Enrichment** **(Not to be included for External Examination)** Comment Line Arguments – Enumerated Types - Finalizer Methods - **Applet Programming:** Building Applet Code - Applet Life Cycle - Creating and Executable Applet – Designing a Web Page using Applet – **Managing Input/Output Files in Java:** 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

Text Book

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

Reference Books

1. S.Sagayaraj, R.Denis, P.Karthik and D.Gajalakshmi,(2017)."*Java programming*", Universities Press.
2. Schildt Herbert,(2011)."*Java :The Complete Reference*", 8th Edition Tata McGraw-Hill.
3. C.Muthu, (2008)."*Programming with JAVA*", Second Edition, McGraw Hill Education
4. Ken Arnold gosling and Davis Holmen,(2005). "*The JAVA Programming Language*",4th 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

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

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	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO5
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   "2"–Moderate (Medium) Correlation
"3"-Substantial (High) Correlation   "-"-indicates there is no Correlation.

List of 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**	
23UCS2CC3P	DATA VISUALIZATION (P)	CORE	2	2	

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

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

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

CO s	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	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   "2"–Moderate (Medium)Correlation
"3"–Substantial (High) Correlation   "-" indicates there is no Correlation.

List of 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. Book marks
   e. Dashboard Creation
   f. Data Visualization

Web References:

1. https://www.tutorialspoint.com/excel_data_analysis/index.htm

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

Pedagogy:
Demo by e-Contents

Course Designer:
Ms.N.Agalya

Semester II	Internal Marks:25		External Marks:75	
COURSE CODE	**COURSE TITLE**	**CATEGORY**	**HOURS/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 On the successful completion of the course, students will be able to	Cognitive Level
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

CO s	PSO1	PSO2	PSO3	PSO4	PSO5	PO1	PO2	PO3	PO4	PO 5
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.

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

VI	**Self-Study for Enrichment** **(Not included for End Semester Examination)** 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 PVTLtd.

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
7. https://youtu.be/s5KZw1EpBEo

Pedagogy

Power point presentation, Group discussion, Seminar, Assignment.

Course Designers

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