DEPARTMENT OF COMPUTER SCIENCE WITH DATA ANALYTICS

Nallamuthu Gounder Mahalingam College
(Autonomous)
(An ISO 9001:2015 Certified Institution)
Re-Accredited with 'B' Grade by NAAC
Pollachi-642001

SYLLABUS

B.Sc. COMPUTER SCIENCE WITH DATA ANALYTICS

BATCH 2023-2026

NGM COLLEGE

Vision

Our dream is to make the College an institution of excellence at the national level by imparting quality education of global standards to make students academically superior, socially committed, ethically strong, spiritually evolved and culturally rich citizens to contribute to the holistic development of the self and society.

Mission

Training students to become role models in academic arena by strengthening infrastructure, upgrading curriculum, developing faculty, augmenting extension services and imparting quality education through an enlightened management and committed faculty who ensure knowledge transfer, instill research aptitude and infuse ethical and cultural values to transform students into disciplined citizens in order to improve quality of life.

DEPARTMENT OF COMPUTER SCIENCE WITH DATA ANALYTICS

Vision

To prepare the next generation of practitioners and researchers for a data centric world and to achieve the academic excellence and research in the field of Data Science and Analytics at the national and global levels.

Mission

- To develop professionals who are skilled in the area of Data science and analytics
- To impart quality and value-based education and contribute towards the innovation of computing expert systems.
- To apply new advancements in high performance computing hardware and software

Program Educational Objectives (PEOs)	
The B.Sc. Computer Science with Data Analytics program describe accomplishments that graduates are expected to attain within five to seven years after graduation.	
PEO1	Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics
PEO2	Apply principles of Data Science to the analysis of business problem
PEO3	Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
PEO4	To enhance communicative skill and inculcate the spirit through professional activities and to solve the complex problems in data analysis
PEO5	To embed human values and professional ethics in the young minds and contribute towards nation building

Programme Outcomes (POs)	
On successful completion of the B.Sc. Computer Science with Data Analytics	
PO1	**Disciplinary knowledge:** Capable to apply the knowledge of mathematics, algorithmic principles and computing fundamentals in the modeling and design of computer based systems of varying complexity.
PO2	**Scientific reasoning/ Problem analysis:** Ability to critically analyze, categorizes, formulate and solve the problems that emerges in the field of computer science with Data Analytics
PO3	**Problem solving:** Able to provide software solutions for complex Data Analysis problems or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations
PO4	**Environment and sustainability:** Understand the impact of software solutions in environmental and societal context and strive for sustainable development
PO5	**Modern tool usage:** Use contemporary techniques, skills and tools necessary for integrated solutions
PO6	**Ethics:** Function effectively with social, cultural and ethical responsibility as an individual or as a team member with positive attitude**.**
PO7	**Cooperation / Team Work:** Function effectively as member or leader on multidisciplinary teams to accomplish a common objective.
PO8	**Communication Skills**: An ability to communicate effectively with diverse types of audience and also able to prepare and present technical documents to different groups.
PO9	**Self-directed and Life-long Learning:** Graduates will recognize the need for self-motivation to engage in lifelong learning to be in par with changing technology
PO10	**Research:** Enhance the research culture and uphold the scientific integrity and objectivity.

Program Specific Outcomes (PSOs)	
After the successful completion of **B.Sc. Computer Science with Data Analytics** program, the students are expected to	
PSO1	Impart education with domain knowledge and key technologies in data science and business analytics like data mining, machine learning, No SQL, visualization techniques, predictive modeling, and statistics effectively and efficiently in par with the expected quality standards for Data analyst professional.
PSO2	Ability to apply the mathematical, technical and critical thinking skills in the discipline of Data analytics to find solutions for complex problems.

Mapping

PEOs POs \ PSOs	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	H	H	H	L	L
PO2	H	H	H	L	L
PO3	H	H	H	H	L
PO4	L	M	M	M	L
PO5	M	M	M	H	M
PO6	L	L	M	H	L
PO7	M	M	M	H	M
PO8	L	L	L	H	M
PO9	M	M	M	H	L
PO10	M	M	M	M	L
PSO1	H	H	H	M	L
PSO2	H	H	H	H	M

B.SC COMPUTER SCIENCE WITH DATA ANALYTICS
(FOR THE CANDIDATES ADMITTED FROM THE ACADEMIC YEAR 2023 - 2024 ONWARDS) I and II SEMESTERS
SCHEME OF EXAMINATIONS

Part	Subject Code	Title of the Paper	Hrs. / Week		Hrs. / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
			L	P	T		Internal	External		
SEMESTER - I										
I	23UTL1C1	Tamil Paper-I	5	-	-	3	25	75	100	3
	23UHN1C1	Hindi Paper-I								
	23UFR1C1	French Paper-I								
II	23UEN101 / 23UEN102	Communication Skills – I (Level I) / Communication Skills – I (Level II)	5	-	-	3	25	75	100	3
III	23UDA101	**Core Course I:** Programming in C	5			3	25	75	100	4
	23UDA102	**Core Course II:** Digital Electronics	5			3	25	75	100	4
	23UDA1A1/ 23UDA1A2	**Generic Elective – Allied I:** Mathematical Foundation for Data Science/ Numerical Methods	4			3	25	75	100	4
	23UDA103	**Core Course Lab I:** Programming Lab in C		4		3	20	30	50	2
IV	23EVS101	**AECC I:** Environmental Studies	1	-	-	-	-	-	-	-
	23HEC101	Human Excellence - Personal Values & SKY Yoga Practice - I	1	-	-	2	20	30	50	1
V		Extension Activities – Annexure I	-	-	-	-	-	-	-	-
EC		Online Course (Optional) (MOOC / NPTEL / SWAYAM)								Grade
Total			**30**						**600**	**21**

EC – Extra Credit Course / Certificate Course / Co-scholastic Course / Job Oriented Course

CC – Core Course; GE – Generic Elective; AECC - Ability Enhancement Compulsory Course

Part	Subject Code	Title of the Paper	Hrs. / Week			Hrs. / Sem.	Exam Hrs.	Maximum Marks		Total Marks	Credits
								SEMESTER - II			
			L	**P**	**T**			Internal	External		
I	23UTL2C2	TamilPaper-II	5	-	-		3	25	75	100	3
	23UHN2C2	Hindi Paper-II									
	23UFR2C2	French Paper-II									
II	23UEN202 / 23UEN203	Communication Skills – II (Level I) / Communication Skills – II (Level II)	5	-	-		3	25	75	100	3
III	23UDA204	**Core Course III:** Problem Solving using Python	4				3	25	75	100	4
	23UDA205	**Core Course IV:** Data Structures	4				3	25	75	100	4
	23UDA2A1/ 23UDA2A2	**Generic Elective Allied II:** Statistics and Probability/ Optimization Techniques	4				3	25	75	100	4
	23UDA206	**Core Course Lab II:** Programming Lab in Python		4			3	20	30	50	2
	23UDA2S1/ 23UDA2S2	**SEC I: Naan Mudhalvan** Cloud Essentials/ Business English Communication	2				2	20	30	50	2
IV	23EVS201	**AECC I:** Environmental Studies	1				2	-	50	50	2
	23HEC202	Human Excellence - Family Values & SKY Yoga Practice - II	1				2	20	30	50	1
V		Extension Activities - Annexure I	-	-	-	-	-	-	-	-	-
EC	23CMM201	ManaiyiyalMahathuvam - I				15 Hrs.	2	-	50	50	Grade
	23CUB201	UzhavuBharatham - I				15 Hrs.	2	-	50	50	Grade
	23UDA2VA	**VAC - I**				30 Hrs					2*
						45 Hrs					3*
		Online Course (Optional) (MOOC / NPTEL / SWAYAM)									Grade
Total			**30**							**800**	**25**

EC – Extra Credit Course / Certificate Course / Co-scholastic Course / Job Oriented Course

CC – Core Course; GE – Generic Elective; AECC - Ability Enhancement Compulsory Course;

SEC – Skill Enhancement Course VAC – Discipline Specific Value Added Course

*Extra Credits;

Question Paper Pattern
(Based on Bloom's Taxonomy)

K1-Remember; **K2**- Understanding; **K3**- Apply; **K4**-Analyze; **K5**- Evaluate

1. Theory Examinations: 75 Marks (Part I, II, & III)

(i) Test- I & II, ESE:

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q1 – 5 MCQ) (Q6 – 10 Define / Short Answer / MCQ)	10 * 1 = 10	MCQ / Define	**75**
K3 (Q11-15)	B (Either or pattern)	5 * 5 = 25	Short Answers	
K4 & K5 (Q16 – 20)	C (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

2. Theory Examinations: 38 Marks (3 Hours Examination) (Part III: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1 - 10)	A (Q 1 – 10 MCQ)	10 * 1 = 10	MCQ	**50 (Reduced to 38)**
K3 (Q11 – 15)	B (Either or pattern)	5 * 3 = 15	Short Answers	
K4 & K5 (Q16-20)	C (Either or pattern)	5 * 5 = 25	Descriptive/ Detailed	

3. Theory Examinations: 38 Marks (2 Hours Examination) (Part IV: If applicable)

Knowledge Level	Section	Marks	Description	Total
K1 & K2 (Q1-10)	A (Q1 – 5 MCQ) (Q6–10 Define / Short Answer)	10 * 1 = 10	MCQ / Define	**50 (Reduced to 38)**
K3, K4 & K5 (Q11-15)	B (Either or pattern)	5 * 8 = 40	Descriptive/ Detailed	

4. Practical Examinations:

Paper	Maximum Marks	Marks for		Components for CIA		
		CIA	CEE	Tests	Observation Note	Record Note
Practical (Core / Elective)	50	20	30	10	05	05
Practical (Core / Elective)	75	30	45	20	05	05
Practical (Core / Elective)	100	40	60	30	05	05

5. Project:

Paper	Maximum Marks	Marks for		
		CIA	CEE	
			Evaluation	Viva-voce
Project	100	25	50	25
Project	150	40	75	35
Project	200	50	100	50

* CIA – Continuous Internal Assessment & CEE – Comprehensive External Examinations

Components of Continuous Internal Assessment (CIA)

THEORY

Maximum Marks: 100;   CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Test 1	75	(75+75+15+10)/7	25
Test 2 / Model	75		
Assignment / Digital Assignment	15		
Others*	10		

*Others may include the following: Seminar / Socratic Seminars,Group Discussion, Role Play, APS, Class participation, Case Studies Presentation, Field Work, Field Survey, Term Paper, Workshop / Conference Participation, Presentation of Papers in Conferences, Quiz, Report / Content Writing, etc.

Maximum Marks: 50; CIA Mark: 12; CEE Mark: 38; (Part III: If applicable)

Components		Calculation	CIA Total
Test 1	50	(50+50+10+10)/10	12
Test 2 / Model	50		
Assignment / Digital Assignment	10		
Seminar	10		

PROJECT

Maximum Marks: 100; CIA Mark: 25; CEE Mark: 75;

Components		Calculation	CIA Total
Review I	5		
Review II	5		
Review III	5	5+5+5+10	25
Report Submission	10		

Maximum Marks: 200; CIA Mark: 50; CEE Mark: 150;

Components		Calculation	CIA Total
Review I	10		
Review II	10		
Review III	10	10+ 10+10+20	50
Report Submission	20		

* Components for 'Review' may include the following:

Originality of Idea, Relevance to Current Trend, Candidate Involvement, and Presentation of Report for Commerce, Management & Social Work.
Synopsis, System Planning, Design, Coding, Input form, Output format, Preparation of Report & Submission for Computer Science cluster.

Continuous Internal Assessment for Project

For Commerce, Management & Social Work Programme

The Final year Commerce, Management & Social Work students should undergo a project work during (V/VI) semester

❖ The period of study is for 4 weeks.

❖ Project / Internship work has to be done in an industrial organization (or) work on any industrial problem outside the organization is allowed.

❖ Students are divided into groups and each group is guided by a Mentor.

❖ The group should not exceed four students, also interested student can undergo individually.

❖ A problem is chosen, objectives are framed, and data is collected, analyzed and documented in the form of a report / Project.

❖ Viva – Voce is conducted at the end of this semester, by an External Examiner and concerned Mentor (Internal Examiner).

❖ Project work constitutes 100 marks, out of which 25 is CIA and 75 is CEE Marks.

Mark Split UP

CIA	CEE	Total
25	75	100

S. No	Components for CIA	Marks
1	Review – I *	5
2	Review – II *	5
3	Review – III *	5
4	Rough Draft Submission	10
Total		**25**

* Review includes Objectives and Scope, Research Methodology, Literature Review, Data Analysis and Results, Discussion and Interpretation, Recommendations and Implications, Presentation and Format, Creativity and Originality, and Overall Impact and Contribution.

S. No	Components for CEE	Marks
1	Evaluation*	50
2	Viva-Voce	25
Total		**75**

* Evaluation includes Originality of Idea, Relevance to Current Trend, Candidate Involvement, Thesis Style / Language, and Presentation of Report.

Continuous Internal Assessment for Project

For Science Stream

The Final year Science students should undergo a project work during (V/VI) semester

- ❖ The period of study is for 4 weeks.
- ❖ Project / Internship work has to be done in an industrial organization (or) work on any industrial problem outside the organization is allowed.
- ❖ Students are divided into groups and each group is guided by a Mentor.
- ❖ The group should not exceed four students, also interested student can undergo individually.
- ❖ A problem is chosen, objectives are framed, and data is collected, analyzed and documented in the form of a report / Project.
- ❖ Viva – Voce is conducted at the end of this semester, by an External Examiner and concerned Mentor (Internal Examiner).
- ❖ Project work constitutes 200 marks, out of which 50 is CIA and 150 is CEE Marks.

Mark Split UP

CIA	CEE	Total
50	150	200

S. No	Components for CIA	Marks
1	Review – I *	10
2	Review – II *	10
3	Review – III *	10
4	Rough Draft Submission / Report Submission	20
	Total	**50**

* Review I: - Problem Analysis

* Review II: - Data collection & Design

* Review III: - Data Analysis

S. No	Components for CEE	Marks
1	Evaluation *	100
2	Viva-Voce	50
	Total	**150**

* Evaluation includes Problem and Hypothesis, Experimental Design / Materials / Procedure, Variables / Controls / Sample Size, and Data Collection / Analysis.

Continuous Internal Assessment for Project

For Computer Science Cluster

Maximum Marks: 100 Marks

Components for CIA: 25 Marks

Criterion	Mode of Evaluation	Marks	Total
I	Synopsis, Company Profile, System Specification, Existing System, Proposed System OR (For Android Developments) Planning Stage	05	25
II	Supporting Diagrams like system flowchart, ER, DFD, Usecaseand Table Design OR UI and UX Design Application Architect and Prototyping	05	
III	Coding, Input forms, Output format, Testing OR Development, Testing	05	
IV	Preparation of Report & Submission	10	

ComponentsforCEE: 75 Marks

ComponentsforCEE	Marks	Total	Grand Total
Evaluation			75
Title Relevance of the Industry/Institute	10	50	
Technology	10		
Design and Development Publishing	10		
Testing, Report	20		
Viva Voce			
Project Presentation	10	25	
Q&A Performance	15		

COMPUTER SCIENCE PROJECT and VIVA VOCE

Guidelines

Introduction

The title of the project work and the organization will be finalized at the end of the fifth Semester. Each student will be assigned with a Faculty for guidance. The Project work and coding will be carried by using the facility of the computer science lab as well as in the organization. The periodical review will be conducted to monitor the progress of the project work. The project report will be prepared and submitted at the end of the semester. An external examiner appointed by the Controller of Examination will conduct the viva voce examination along with a respective guide.

Area of Work

- Web Based Development
- Mobile app development
- Website development
- IoT Projects
- Big Data and Data Mining Projects
- Cloud Computing Projects
- Networking Projects
- Artificial Intelligence and Machine learning Projects
- Data Analytics Projects using Python, R, Tableau etc..
- System Software
- Web Security Projects
- Image Processing

Methodology

Arrangement of Contents:

The sequence in which the project report material should be arranged and bound as follows:

1. Cover Page & Title Page
2. Bonafide Certificates

3. Declaration
4. Acknowledgement
5. Synopsis
6. Table of Contents
7. Chapters
8. Appendix
9. References

Format of Table of Contents

TABLE OF CONTENTS

Size of the Project

The Project Report contents should be a maximum of not exceeding 70 pages.

STUDENT SEMINAR EVALUATION RUBRIC

Grading Scale:

A	B	C	D
8-10	5-7	3-4	0-2

CRITERIA	A - Excellent	B - Good	C - Average	D - Inadequate
Organization of presentation	Information presented as an interesting story in a logical, easy-to-follow sequence	Information presented in logical sequence; easy to follow	Most of the information is presented in sequence	Hard to follow; sequence of information jumpy
Knowledge of the subject & References	Demonstrated full knowledge; answered all questions with elaboration **&** Material sufficient for clear understanding **AND** exceptionally presented	At ease; answered all questions **but** failed to elaborate **&** Material sufficient for clear understanding **AND** effectively presented	At ease with information; answered most questions **&** Material sufficient for clear understanding **but** not clearly presented	Does not have a grasp of information; answered only rudimentary Questions **&** Material not clearly related to the topic **OR** background dominated seminar
Presentation Skills using ICT Tools	Uses graphics that explain and reinforce text and presentation	Uses graphics that explain the text and presentation	Uses graphics that relate to text and presentation	Uses graphics that rarely support text and presentation
Eye Contact	Refers to slides to make points; engaged with the audience	Refers to slides to make points; eye contact the majority of the time	Refers to slides to make points; occasional eye contact	Reads most slides; no or just occasional eye contact
Elocution – (Ability to speak English language)	Correct, precise pronunciation of all terms The voice is clear and steady; the audience can hear well at all times	Incorrectly pronounces a few terms Voice is clear with few fluctuations; the audience can hear well most of the time	Incorrectly pronounces some terms Voice fluctuates from low to clear; difficult to hear at times	Mumbles and/or Incorrectly pronounces some terms Voice is low; difficult to hear

WRITTEN ASSIGNMENT RUBRIC

Grading Scale:

A	B	C	D	F
13-15	10-12	7-9	4-6	0-3

CRITERION	A - Excellent	B - Good	C - Average	D - Below Average	F - Inadequate
Content & Focus	Hits on almost all content exceptionally clear	Hits on most key points and the writing is interesting	Hits in basic content and writing are understandable	Hits on a portion of content and/or digressions and errors	Completely off track or did not submit
Sentence Structure & Style	* Word choice is rich and varies * Writing style is consistently strong * Students own formal language	* Word choice is clear and reasonably precise * Writing language is appropriate to the topic * Words convey intended message	* Word choice is basic * Most writing language is appropriate to the topic * Informal language	* Word choice is vague * Writing language is not appropriate to the topic * Message is unclear	* Not Adequate
Sources	Sources are cited and are used critically	Sources are cited and some are used critically	Some sources are missing	Sources are not cited	Sources are not at all cited
Neatness	Typed; Clean; Neatly bound in a report cover; illustrations provided	Legible writing, well-formed characters; Clean and neatly bound in a report cover	Legible writing, some ill-formed letters, print too small or too large; papers stapled together	Illegible writing; loose pages	Same as below standard
Timeliness	Report on time	Report one class period late	Report two class periods late	Report more than one week late	Report more than 10 days late

SEMESTER I

Programme Code:	B.Sc			Programme Title:	B. Sc Computer Science with Data Analytics	
Course Code:	23UDA101			Title	Batch:	2023 - 2026
					Semester:	I
Lecture Hrs./Week or Practical Hrs./Week	5	Tutorial Hrs./Sem -	5	Core Course I: Programming in C	Credits:	4

Course Objective

To introduce the concepts of procedure-oriented programming and the various problem-solving skills and programming constructs of C programming

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Remembering the history, importance and basic structure of C programming	K1
CO2	Interpret the concepts of variables, constants, operators and various types of expressions	K2
CO3	Apply the concept of Decision-making statements and looping constructs for solving basic programs	K3
CO4	Use the concepts of files and pointers inside a C program	K4
CO5	Develop programs incorporating all the C language constructs	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	L	M	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	**Introduction to Computing:** Components of a computer – Concepts of hardware and software – Art of programming through Algorithms and Flowcharts. **Overview of C:** History of C – Importance of C – Basic structure of C Program – Programming Style – Executing a C Program. **Constants, Variables and Data Type**s: Introduction - Character set - C tokens - keyword & Identifiers - Constants - Variables - Data types - Declaration of variables – Declaration of Storage Class - Assigning values to variables - Defining Symbolic Constants – Declaring a variable as constant – Declaring a variable as Volatile	14
Unit II	**Operators and Expressions:** Arithmetic, Relational, Logical, Assignment, Conditional, Bitwise, Special, Increment and Decrement operators- Arithmetic Expressions- Evaluation of expression- precedence of arithmetic operators- Type conversion in expression–operator precedence & associativity– Mathematical functions. **Managing Input and Output Operations**: Reading & Writing a character - Formatted input and output	14
Unit III	**Decision Making and Branching**: Introduction – simple if, if….else, nesting of if…else statements - else if ladder –The switch statement, The ?: Operator – The goto Statement. **Decision Making and Looping**: Introduction-The while statement- the do statement–the for statement- jumps in loops – Concise test Expression **Arrays:** Introduction – One dimensional array – Declaration of one dimensional array – Initialization of one dimensional array – Two dimensional array – Initializing two dimensional array – Multidimensional arrays – Dynamic arrays	15
Unit IV	**Character Arrays and Strings:** Introduction – Declaring and Initializing string variables – Reading String from terminal – Writing String to Screen – Arithmetic Operations on Characters – Putting Strings together – Comparison of two Strings – String handling functions – Table of Strings. **User-Defined Functions:** Introduction–Need for User-Defined Functions-A multi-function program – Elements of User-Defined Functions - Definition- Return values and their types – Function Calls– Function Declarations–Category of Functions- Nesting of Functions- Recursion – Passing Arrays to Functions – Searching and Sorting - Passing String to Functions - The Scope, Visibility and Life time of Variables- Multi file Programs **Structures and Unions:** Introduction – Defining a Structure – Declaring Structure variable – Accessing structure member – Structure Initialization – Copying and Comparing Structure Variables – Operations on Individual Members – Array of Structures – Arrays within Structures – Structures within Structures - Structures and Functions – Unions – Size of Structures – Bit Fields	16
Unit V	**Pointers:** Introduction- Understanding pointers-Accessing the address of a variable-Declaration and Initialization of pointer Variable – Accessing a variable through its pointer-Chain of pointers- Pointer Expressions – Pointer Increments and Scale factor- Pointers and Arrays- Pointers and Character Strings – Array of pointers – Function that return multiple values - Pointers as Function Arguments-Functions returning pointers – Pointers to Functions – Pointers and Structures. **File Management in C:** Introduction – Defining and opening a file – closing a file – Input/output operations on files – Error Handling during I/O operations – Random Access to files – Command Line Arguments	16
	Total Contact Hrs	75

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E Balagurusamy	Programming in ANSI C	Tata McGraw-Hill, Eighth Edition	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ashok N Kamthane	Programming with ANSI and Turbo C	Pearson	2002.
2	Henry Mullish& Hubert L. Cooper	The Spirit of C	Jaico,	1996

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc			Programme Title:	B. Sc Computer Science with Data Analytics	
Course Code:	23UDA102			Title	Batch:	2023 - 2026
					Semester:	I
Lecture Hrs./Week or Practical Hrs./Week	5	Tutorial Hrs./Sem -	-	Core Course II: Digital Electronics	Credits:	4

Course Objective

To introduce the concepts of digital electronics like number systems, Logic Gates and Circuits, Boolean Algebra, Combinational logic circuits, sequential logic circuits and its applications.

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge about the number systems and coding systems	K1
CO2	Understand about Boolean Algebra & its function, DeMorgans Theorems.	K2
CO3	Understand about Logic gates and circuits.	K3
CO4	Have knowledge on Combinational logic circuit.	K4
CO5	Learning Sequential logic circuits such as flip flop and counter	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	M	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	H	M	L	M	L	H	L	H	H
CO3	M	H	M	H	M	L	M	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	M	H
CO5	H	M	H	M	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	**NUMBER SYSTEMS AND CODES** Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Binary Addition – Binary Subtraction – Binary Multiplication and Division – Octal Numbers – Hexadecimal Numbers – Binary Codes – Error Detecting Codes – Error Correcting Codes.	14
Unit II	**LOGIC GATES AND CIRCUITS** Boolean Algebra and Logic Gates – AND, OR, NOT, NAND, NOR, Exclusive OR – Applications of XOR Gate – The Exclusive NOR Gate – Positive and Negative Logic– Integrated Circuits.	14
Unit III	**BOOLEAN ALGEBRA** Fundamentals of Boolean Algebra – Boolean Functions – Minterms and Maxterms – Laws and Theorems of Boolean Algebra – DeMorgan‟s Theorem – UniversalBuilding Blocks – Karnaugh Maps – Simplification – Don‟t Care Conditions – Overlapping Groups – Rolling the Map – Eliminating Redundant Groups.	15
Unit IV	**COMBINATIONAL LOGIC CIRCUITS** Introduction – Adders – The Half Adder – The Full Adder –Subtractors – BCD Adder – Multiplexers – Demultiplexers – Decoders – Encoders – FloatingPoint Number System – Range of Stored Numbers.	16
Unit V	**SEQUENTIAL LOGIC CIRCUITS** Flip Flops – RS Flip Flop – Clocked RS Flip Flop – D Flip Flop – JK Flip Flop – T Flip Flop – Triggering of Flip Flops – Master Slave Flip Flop – Conversion ofD Flip Flop – Conversion of T Flip Flop – Transfer Circuit – Clock. **Counters and Shift Registers:** Counters – Asynchronous or Ripple Counter – Ring Counter – Twisted Ring Counter – State Diagrams and State Tables.	16
	Total Contact Hrs	**75**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Dr. K. Meena	Principles of Digital Electronics	PHI Learning Private Limited, New Delhi,	2009.

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	V.K. Puri,	Digital Electronic circuits and Systems	Tata McGraw-Hill Publishing Company Limited	2007.
2	Malvino and Leach	Digital Principles and Applications	Tata McGraw-Hill Publishing Company Limited	2006

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc,	Programme Title:	B.ScComputer Science with Data Analytics	
Course Code:	23UDA1A1	Title	Batch:	2023 - 2026
		Generic Elective Allied I : Mathematical Foundation for Data Science	Semester:	I
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem	5	Credits:	4

<div align="center">Course Objective</div>

- To know the concept of Mathematical logic
- To learn the concept of Relations
- To make the students to learn various functions
- To inculcate the knowledge in graph theory

<div align="center">Course Outcome</div>

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the concepts of equivalence formulas	K1
CO2	Work with normal forms,	K2
CO3	Understand the mathematical tools that are needed to solve optimizationproblems,	K3
CO4	Model the problems in computer science using graphs and trees	K4
CO5	Work with trees and fundamental circuits	K5

<div align="center">Mapping</div>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	M
CO5	H	M	H	H	L	L	M	L	M	H	H	H

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Units	Content	Hrs
Unit I	**Mathematical logic:** Equivalence of formulas – Duality Law – Tautological implications – Functionally complete sets of connectives – Other connectives. Normal Forms – Disjunctive Normal forms – Conjunctive Normal Forms – Principal Disjunctive Normal forms – Principal Conjunctive Normal Forms – Ordering and Uniqueness of Normal Forms – The Theory of inference for the Statement Calculus – Rules of inference – Consistency of Premises and Indirect Method of Proof	12
Unit II	**Relations:** Introduction – Properties of binary relations in a set – Relation matrix on the Graph of a relation in Set – Partition and covering of a set – Equivalence Relation – Compatibility relations – Composition of binary Relations – Partial ordering.	12
Unit III	**Functions:** Definition and Introduction – Composition of functions – Inverse functions – Peano axioms and mathematical induction.	12
Unit IV	**Graph theory:** **Introduction:** Definition – Finite and Infinite graph – Incidence and degree – Isolated vertex, Pendant vertex and null graph. **Paths and Circuits:** Isomorphism – Subgraphs –Walks, Paths and Circuits – Connected Graphs, Disconnected Graphs and Components– Euler Graphs – more on Euler Graphs – Hamiltonian graphs and circuits – Travelling salesman problem.	12
Unit V	**Graph theory**: **Trees and fundamental circuits**: Trees – Some properties of trees – Pendant vertices in a tree – Distance and Centers in a tree – Rooted and Binary trees – Spanning Trees	12
	Total Contact Hrs	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	J.P. Tremblay and R.Manohar	Discrete Mathematical Structures with Applications to Computer Science **Unit – I:** Sections 1.2.9 to 1.2.14, 1.3.1 to 1.3.5, 1.4.2, 1.4.3 **Unit – II**: Sections2.3.1 to 2.3.8 **Unit – III:** Sections 2.4.1 to 2.4.3, 2.5.1	Hill Edition	Reprint 2007.
2	Narasing Deo	Graph theory with application to engineering and computer science **Unit – IV:** Sections 1.1 to 1.5, 2.1,2.2,2.4 to 2.6,2.8 to 2.10 **Unit – V:** Sections 3.1 to 3.5,3.7	Prentice-Hall of India Pvt.-New Delhi-1.	2016.

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	J.K. Sharma , .	**Discrete Mathematics**	TRINITY Press (An imprint of Laxmi Publications pvt .Ltd.). 4th Edition	Reprint 2015
2	P.R.Vittal, V.Malini	**Operations Research**	Prentice-Hall of India	Reprint 2007.

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Mr. S. Earnest RajaDurai	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc,	Programme Title:	B.Sc Computer Science with Data Analytics		
Course Code:	23UDA1A2	Title	**Batch:**	2023 - 2026	
		Generic Elective – Allied I Numerical Methods	**Semester:**	I	
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.** 5		**Credits:**	4

Course Objective

      This course helps the students to have an in-depthknowledge of various advanced methods in numerical analysis. The students to use numerical techniques to get numerical solutions of equations like transcendental and non-linear differential equations when ordinary analytical methods fail.

Course Outcomes (CO)

On successful completion of this core paper, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the need of numerical analysis techniques in the areas of approximation theory, and recall some basic concepts.	K1
CO2	Apply the numerical methods for approximating the solution to problems of algebraic and transcendental equations, simultaneous linear equations.	K3
CO3	Estimating the value of a function for any intermediate value of the independent variable using Newton Forward and Backward interpolation Formula as well compute the derivatives using Newton's forward and backward difference formula and Sterling's formula.	K3
CO4	Solve the ordinary and partial differential equations by using Numerical method techniques like Taylors method, Euler's method, RungeKutta method etc.	K4
CO5	Enrich the knowledge of numerical techniques and getting insight of algorithmic approach.	K4

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	M
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs.
Unit I	**The solution of Numerical Algebraic and Transcendental Equations**: Introduction - The Bisection method - The iteration method - The method of false position (Regula Falsi Method) - Newton Raphson method. **Chapter 3: Sections: 1 - 5.** **Simultaneous Linear Algebraic Equations:** Introduction – Gauss Elimination Method – Gauss Jordan Method – Computation of the inverse of a Matrix using Gauss's Elimination Method. **Chapter 4: Sections: 1 – 3.**	12
Unit II	**Simultaneous Linear Algebraic Equations:** Iterative Methods - Gauss-Jacobi Method – Gauss-Seidal Method – *Comparison of Gauss elimination and Gauss-Seidal Iteration methods (Self study).* **Chapter 4: Sections: 6, 7.** **Interpolation**: Introduction - Linear interpolation - Gregory Newton Forward and Backward interpolation Formula - Equidistant terms with one or more missing values. **Chapter 6: Sections: 1 - 5.**	12
Unit III	**Numerical Differentiation**: Introduction - Newton's forward difference formula to compute the derivatives - Newton's backward difference formula to compute the derivatives - Derivatives using Stirling's formula. **Chapter 9: Sections: 1 - 4.** **Numerical Integration**: The Trapezoidal rule - Romberg's method - Simpson's one third rule - Practical applications of Simpson's rule. **Chapter 9: Sections: 8 -10 and 12.**	12
Unit IV	**Numerical Solution of Ordinary Differential Equations**: Solution by Taylor Series - Taylor Series method for higher order differential equations- Euler's method - Improved Euler's method - Modified Euler method - RungeKutta method - Second order RungeKutta Method - *Higher order RungeKutta methods (Self study).* **Chapter 11: Sections: 6, 8, 10 - 15**.	12
Unit V	**Numerical Solution of Partial Differential Equations**: Elliptic equations – Solution of Laplace's equation by Iteration – Poisson's equation. **Chapter 12: Sections: 5, 6, 7.**	12

Pedagogy:

Direct Instruction, Flipped Class, Power Point Presentation.

Assessment Methods:

Seminar, Chalk and talk, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Venkataraman M. K	Numerical Methods in Science and Engineering	The National Publishing Company	2009

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Kandasamy P, Thilagavathy K and Gunavathi K	*Numerical Methods*	S. Chand company Ltd	2012

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
S. Earnest Rajadurai	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc			Programme Title:	B.ScComputer Science with Data Analytics		
Course Code:	23UDA103			Title		Batch:	2023 - 2026
				Core Course: Lab I Programming Lab in C		Semester:	I
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem.	60			Credits:	2

Course Objective

- To introduce the concepts of Procedure Oriented Programming and the various programming constructs of C

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Apply the various basic programming constructs like decision making statements. Looping statements, functions, structures, pointers and files	K3
CO2	Design programs using the concept of files in C and be able to simulate operations	K4
CO3	Determine the efficient techniques in programming to solve various scientific problems	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	L	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H

Content
SET A
1. Write a C program to calculate the average of N numbers 2. Write a C program to check the greatest among three numbers. 3. Write a C program for finding sum of individual digits. 4. Write a C program to check whether the given number is Armstrong number or not. 5. Write a C program to generate the prime numbers between a given range. 6. Write a C program to generate the Fibonacci series for the given number.

7. Write a C program to print the Floyd's triangle.
8. Write a C program to calculate the factorial value for the given number using recursion.
9. Write a C program to find the reverse of a given number.
10. Write a C program to find if the given string is a palindrome or not.
11. Write a C program to count the number of vowels in a given string.
12. Write a C program to convert upper case to lower case and lower case to upper case.
13. Write a C program to insert or delete an element in an array.

SET B

14. Write a C program to sort the numbers in ascending /descending order using arrays.
15. Write a C program to find the addition of matrix.
16. Write a C program to find the matrix multiplication
17. Write a C program to display transpose matrix of a given number.
18. Write a C program to sort the strings in alphabetical order.
19. Write a C program to perform linear search in a given array.
20. Write a C program to create a student file with reg no, name, mark1, mark2..
21. Write a C program to merge two files. (Using Files)
22. Write a C program to read and write to the file Using fread() and fwrite() functions.
23. Write a program to implement command line arguments

Total Hours 60

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	E Balagurusamy	Programming in ANSI C	Tata McGraw-Hill, Eighth Edition	2019

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ashok N Kamthane	Programming with ANSI and Turbo C	Pearson	2002.
2	Henry Mullish& Hubert L. Cooper	The Spirit of C	Jaico,	1996

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

SEMESTER II

Programme Code:	B.Sc			Programme Title:	B.Sc Computer Science with Data Analytics	
Course Code:	23UDA204			Title	Batch:	2023 - 2026
				Core Course III: Problem Solving using Python	Semester:	II
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem.	5		Credits: 4	4

Course Objective

- To know and understand the basics of Python programming.
- To able to understand the concepts of decision and control statements.
- To learn the concepts of functions and strings.
- To use Python data structures – lists, tuples and dictionaries.
- To learn the concept of Python Libraries

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Develop solutions to simple computational problems.	K1
CO2	Decompose a Python program into functions.	K2
CO3	Represent compound data using Python lists, tuples and dictionaries.	K3
CO4	Apply OOPs concepts in real-time Python applications.	K4
CO5	Apply the python library functions for machine learning	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	m	H	L	M	L	H	L	H	H
CO3	M	M	M	H	M	L	M	M	M	m	H	H
CO4	M	H	M	H	M	M	H	L	M	L	H	H
CO5	H	M	H	H	m	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	**Introduction:** History of Python – Executing Python Programs – Commenting in Python – Internal Working of Python - Python Character Set – Token – Python Core Data Type – print() Function – Assigning Values to Variables – Multiple Assignments – input() Function – eval() Function – Formatting Numbers and Strings – Python Inbuilt Functions - Decision and Loop Control Statements	12
Unit II	**Functions:** Introduction – Syntax and Basics of Function – Use of a Function – Parameters and Arguments in a Function – Local and Global Scope of a variable – return Statement – Recursive Functions – Lambda function. **Strings:** Introduction – str class – Basic Inbuilt Python Functions for String – Traversing String with for and while Loop – Immutable Strings – Various String Operations.	11
Unit III	**Lists**: Introduction – Creating Lists – Accessing the Elements of a List – Negative List Indices – List Slicing - List Slicing with Step Size – Python Inbuilt Functions for Lists – List Operator – List Comprehensions – List methods – List and Strings – Splitting a String in List – Passing and Returning List from a Function. **Tuples :** Creating Tuples - tuple() Function - Inbuilt Functions for Tuples - Indexing and Slicing - Operations on Tuples - Passing Variable Length Arguments to Tuples - Lists and Tuples - Sort Tuples - Traverse Tuples from a List - zip() Function - Inverse zip(*) Function	12
Unit IV	**Sets:** Creating Sets - Set in and not in Operator - Python Set Class - Set Operations. **Dictionaries**: Need of Dictionaries - Basics of Dictionaries - Creating a Dictionary - Adding and Replacing Values - Retrieving Values - Formatting Dictionaries - Deleting Items - Comparing Two Dictionaries - Methods of Dictionary Class - Traversing Dictionaries - Nested Dictionaries - Traversing Nested Dictionaries. **File Handling:** Introduction – Need of File Handling – Text Input and Output – seek( ) Function – Binary Files.	12
Unit V	**Object-Oriented Programming: Class, Objects and Inheritance:** Defining Classes – Self-parameter and Adding Methods to a Class – Display Class Attributes and Methods – Special Class Attributes – Accessibility – Constructor and Destructor Methods – Passing an Object as Parameter to a Method – Method Overloading – Operator Overloading – Inheritance – Types of Inheritance – Using super() – Method Overriding.	13
	Total Contact Hrs	**60**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ashok Namdev Kamthane, Amit Ashok Kamthane,	Programming and Problem Solving with PYTHON	McGraw Hill Education (India) Private Limited,	First Edition, 2018.

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Allen Downey, Jeffrey Elkner, Chrish Meyers	How to Think like a Computer Scientist-Learning with Python	Dreamtech Press	Reprint Edition 2016.
2	Timothy A, Budd	Exploring Python	McGraw Hill Education India Private Limited	Tenth Reprint, 2017
3	Peter Norton et al.,	Beginning Python	Wiley &Dreamtech Press	2006
4	Al Sweigart,	Automate the Boring Stuff with Python: Practical Programming for Total Beginners	No Starch Press,	2nd Edition, 2019
5	Liang Y. Daniel	Introduction to Programming Using Python	Pearson Education	2017

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

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Programme Code:	B.Sc			Programme Title:	B.Sc Computer Science with Data Analytics
Course Code:	23UDA205			**Title**	**Batch:**	2023 - 2026
				Core Course IV: Data Structures	**Semester:**	II
Lecture Hrs./Week or Practical Hrs./Week	4	**Tutorial Hrs./Sem.**	-		**Credits:**	4

Course Objective

- To introduce the concept of data structures and the types of data structures
- To demonstrate how various data structures can be implemented and used in various application

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Define the concept of Data structure and list the various classifications of data Structures like array, stack and Queue	K1
CO2	Demonstrate how linked lists, Linked Staak and Linked Queue works	K2
CO3	Defines Trees and Binary Trees and its Working	K3
CO4	Illustrate the various file organizations like Sequential, Random and the concept of Hash Table	K4
CO5	Design algorithms for various sorting and searching techniques	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	H	H	L	M	L	H	L	H	H
CO3	M	M	M	H	M	L	M	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	H
CO5	H	M	H	H	L	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	Introduction – Analysis of Algorithms – **Arrays**: Introduction – Array Operations – Number of Elements in an Array – Representation of arrays in Memory – Applications **Stacks:** Introduction – Stack Operations – Applications **– Queues:** Introduction – Operations on Queue – Circular Queues – Other types of Queues -	12

1	Applications		
Unit II	**Linked List:**Introduction - Singly Linked List –Circularly Linked Lists – Doubly Linked List – Multiply Linked List – Applications **Linked Stacks and Linked Queues**: Introduction – Operations on Linked Stacks and Linked Queues – Dynamic Memory Management and Linked Stacks – Implementation of Linked Representation - Applications	11	
Unit III	**Trees and Binary Trees:** Introduction – Trees: Definition and Basic Terminologies – Representation of Tress – Binary Trees: Basic Terminologies and Types – Representation of Binary Tress – Binay Tree Traversal – Threaded Binary Trees **Graphs:** Introduction – Definition and Basic Terminologies – Representation of Grpahs – Graph Traversals - Applications	12	
Unit IV	**Hash Table:** Introduction – Hash Table Structure – Hash Functions – Linear Open Addressing – Chaining – Applications **File Organization:** Introduction – Files - Keys – Basic File Operation – Heap or Pile Organization – Sequential File Organization – Indexed Sequential File Organization - Direct File Organization	12	
Unit V	**Searching:** Introduction – Linear Search – Transpose Sequential Search – Interpolation Search – Binary Search – Fibonacci Search – Other Search Techniques **Internal Sorting**: Introduction – Bubble Sort - Insertion Sort – Selection Sort – Merge Sort – Shell Sort - Quick Sort - Heap Sort- Radix Sort.	13	
	Total Contact Hrs	60	

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ellis Horowitz, Sartaj Shani	Data Structures	GalgotiaPublication.	2008

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ellis Horowitz, Sartaj Shani, Sanguthevar Rajasekaran	Computer Algorithms	Galgotia Publication	2007

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc			Programme Title:	B.Sc Computer Science with Data Analytics		
Course Code:	23UDA2A1			Title	Batch:	2023 - 2026	
				Generic Elective - Allied II: Statistics and Probability	Semester:	II	
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem.	5		Credits:	4	

Course Objective

To introduce the concepts of statistics and Probability in the field of Data Scienc

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.	K1
CO2	Understand the basic concepts of one- and two-dimensional random variables and apply in engineering applications.	K2
CO3	Apply the concept of testing of hypothesis for small and large samples in real life problems	K3
CO4	Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.	K4
CO5	Have the notion of sampling distributions and statistical techniques used in engineering and Management problems.	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	L	H	M	L	L	L	M	M	H	H
CO2	H	L	H	H	H	L	M	L	M	L	H	M
CO3	M	H	M	H	H	L	M	M	M	H	H	H
CO4	L	L	M	H	H	L	H	L	H	L	H	L
CO5	H	M	H	H	M	H	L	L	H	H	H	H

Units	Content	Hrs
Unit I	Probability – The axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.	12
Unit II	Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).	11
Unit III	Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit..	12
Unit IV	One way and Two-way classifications – Completely randomized design – Randomized block design – Latin square design – 22 factorial designs.	12
Unit V	Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) –Tolerance limits – Acceptance sampling.	13
	Total Hours	**60**

Pedagogy

> Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

> Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Johnson, R.A., Miller, I and Freund J.,	Probability and Statistics for Engineers	Pearson Education, Asia, 8th Edition	2015
2	Milton. J. S. and Arnold. J.C	Introduction to Probability and Statistics	Tata McGraw Hill, 4th Edition	2007

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Devore. J.L.	Probability and Statistics for Engineering and the Sciences‖,	Cengage Learning, New Delhi, 8th	2014

				Edition	
2	Papoulis, A. and Unni krishnapillai, S.	Probability, Random Variables and Stochastic Processes	McGraw Hill Education India, 4th Edition, New Delhi.	2010	
3	Ross, S.M.,	Introduction to Probability and Statistics for Engineers and Scientists	Elsevier, 3rd Edition.	2004	
4	Spiegel. M.R., Schiller. J. and Srinivasan, R.A.,	Schaum's Outline of Theory and Problems of Probability and Statistics	Tata McGraw Hill Edition	2004	
5	Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K.	Probability and Statistics for Engineers and Scientists	Pearson Education, Asia, 8th Edition	2007	

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Mr. Earnest Rajadurai Signature	Dr. E. Rama Devi Signature	Mr. K. Srinivasan Signature	Dr. R .ManicaChezian Signature

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Programme Code:	B.Sc,			Programme Title:		B.Sc Computer Science with Data Analytics	
Course Code:	23UDA2A2			Title		Batch:	2023 - 2026
				Generic Specific Elective: Allied II: OptimizationTechniques		Semester:	I
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem .	5			Credits:	4

COURSEOBJECTIVES

The course aims to

- Understand how to translate a real-world problem to mathematical formulation.
- Understand the basic assumptions and properties of LPP by using graphical and simplex methods.
- Structure special type of LP Problems using transportation and assignment models.
- Solve some specific problems of scheduling jobs on two or three machines.
- Realize the need to study replacement and maintenance analysis techniques.
- Learn the variety of performance measures of a queuing system.
- Construct network diagrams with the single and three time estimates of activities involved in a project.

COURSEOUTCOMES:

On completion of the course, students should be able to

CO Number	CO Statement	Knowledge Level
CO1	Formulate OR models to solve real life problems by using graphical and simplex methods.	K1
CO2	Analyze the advanced methods for large scale transportation and assignment problems.	K2
CO3	Evaluate sequencing problems of scheduling jobs on two or three machines.	K3
CO4	Appreciate the use of replacement analysis in handling problems like" Staffing problem and equipment renewal problem"etc.	K4
CO5	Apply various methods to select optimum strategies to win the game.	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	M	M	H	H	L	M	L	M	L	H	H
CO3	M	H	M	H	M	M	H	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	L	H	M
CO5	H	M	H	H	L	L	M	L	M	H	H	H

SYLLABUS

UNIT	CONTENT	No. ofHours
I	Introduction to Optimization Techniques - Linear programming problem(LPP): Definition-Canonical form,Standard form and Formulation of a LPP- Solving LPP by Graphical and Simplex methods – Simple problems.	13
II	Transportation problem - Finding Initial Basic Feasible Solution – NorthWest Corner Method, Least Cost Method, Vogel"s Approximation Method and Optimal solution–MoD imethod-Assignment Problem– Maximization, Minimization and Restricted assignment problem – SimpleProblems.	13
III	Sequencing problem – Johnson"s rule for n jobs – 2 machines, n job 3machines problems – Replacement problems – Elementary replacement models-items whose efficiency deteriorates with time and value of money remains constant during a period.	10
IV	Game theory – concept of pure and mixed strategies – value of games –solving 2 person zero sum games with saddle point – solving 2X2 games without saddle point – simple problem – dominance principle – simple problem .Queuing theory–introduction–queuing system–description of Poisson queues– problem on$\{(M/M/1): (\infty/ FIFO)\}$only.	12
V	Network analysis: PERT&CPM network components and precedence Relationship–critical path analysis–project scheduling with uncertain activity times–simple problem.	12

Note:80%Problemsand20%Theory.

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

TextBooks:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Hamady,A.Taha	Operations Research An Introduction	DorlingKindersley	2013
2	RonaldL. Rardin	Optimizationin Operations Research	PerasonEducationPvt Ltd	2003
3	Dr.S.P.Gupta,Dr.P.K.Gupta&Dr.ManMohan,	Business Statistics and OperationResearch	SultanChand&Sonspublishers, 5th edition	2011

Referencebooks:

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	JKSharma	Operations Research	Macmillan Publishers India Ltd	2017
2	S.Kalavathy	Operations Research	Vikas Publishing house, ,4thEdition	2003
3	Anderson,SweeneyWilliams	Quantitative Methods for Business	Thomson Learning,	2004
4	RathindraP.Sen	Operations Research	PHILearning	2012

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
S. Earnest Rajadurai	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature

Programme Code:	B.Sc	Programme Title:	B.ScComputer Science with Data Analytics		
Course Code:	23UDA206	Title		Batch:	2023 - 2026
		Core Course: Lab II Programming Lab in Python		Semester:	II
Lecture Hrs./Week or Practical Hrs./Week	4	Tutorial Hrs./Sem.	60	Credits:	2

Course Objective

- o To know and understand the basics of Python programming.
- o To able to understand the concepts of decision and control statements.
- o To learn the concepts of functions and strings.
- o To use Python data structures – lists, tuples and dictionaries.
- o To learn the concept of Python Libraries

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Knowledge of various python tools and python program execution	K3
CO2	Solve Problems using control structures, functions, list, tuples and dictionaries	K4
CO3	Solve problems using OOPs concept, file handling and python libraries	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	L	M	L	M	M	H	H
CO2	H	H	H	m	H	L	M	H	H	L	H	H
CO3	M	M	M	H	M	H	M	M	M	m	H	H

Content

1. Write a Python program that displays the following information: Name, Address, Mobile number, College Name and Course
2. Write a Python program to find the largest of three numbers using if else and conditional operator
3. Develop a Python program to print the Employee pay slip using eval() function.
4. Write a Python program to find the difference between the ASCII code of the any lower case letter and its corresponding uppercase letter.
5. Write a Python program to demonstrate the uses of various python built-in functions.
6. Write a Python program to print the number of days in a month.
7. Read a distance in meter and a time in seconds through keyboard. Write a Python program to calculate the speed of a car in meter/second.

8. Implement the string operations using string slicing functions.
9. Write a Python program to strip unwanted character from a string.
10. Write a python program to find the product of two matrices
11. Write recursive functions for the factorial of positive integer
12. Write recursive functions to display prime number from 2 to n
13. Write a python program that writes a series of random numbers to a file from 1 to n and display
14. Consider the list with mixed type of elements, such as L1=[1,"x",4,6,90, "apple", „a",o,4]. Create another list using comprehension which consists of only the integer element present within the list L1.
15. Write a function reverse(Lst) to reverse the elements of a list.
16. Write a program to assign grades to students and display all the grades using keys() and get() method of a dictionary.
17. Write a python program to demonstrate the use of super().
    Write a Python program to perform arithmetic operations on complex numbers using method overloading.
17. Write a program to add the content of a file numbers.txt and display the sum of all numbers present in a file.
18. Write a python program to make a simple calculator
19. Write a python program for Linear Search and Binary Search.
20. Write the python program to implement python libraries

Total Hours 60

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Ashok Namdev Kamthane, Amit Ashok Kamthane,	Programming and Problem Solving with PYTHON	McGraw Hill Education (India) Private Limited,	First Edition, 2018.

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Allen Downey, Jeffrey Elkner, Chrish Meyers	How to Think like a Computer Scientist-Learning with Python	Dreamtech Press	Reprint Edition 2016.
2	Timothy A, Budd	Exploring Python	McGraw Hill Education India Private Limited	Tenth Reprint, 2017
3	Peter Norton et al.,	Beginning Python	Wiley &Dreamtech Press	2006
4	Al Sweigart,	Automate the Boring Stuff with Python: Practical Programming for Total Beginners	No Starch Press,	2nd Edition, 2019
5	Liang Y. Daniel	Introduction to Programming Using Python	Pearson Education	2017

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	Name and Signature	Name and Signature	Name and Signature
Dr. E. Rama Devi Signature	Dr. E. Rama Devi Signature	Mr. K. Srinivasan Signature	Dr. R .ManicaChezian Signature

Programme Code:	B.Sc			Programme Title:	BSc Computer Science with Data Analytics
Course Code:	22UDA2S1			Title	Batch:	2023 - 2026
				SEC I: Cloud Essentials	Semester:	IV
Lecture Hrs./Week or Practical Hrs./Week	2	Tutorial Hrs./Sem.	30		Credits: 4	4

Course Objective

To enable the students to gain the knowledge about Cloud Computing

- Understand the cloud computing architectures, applications and challenges.
- Know how the data is stored in the cloud and the various services offered by the cloud.
- Develop the skills in Web Application Development using cloud technologies

Course Outcome

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

CO Number	CO Statement	Knowledge Level
CO1	Understand the basic knowledge on cloud	K1
CO2	Understand the concept of cloud computing services and its business value	K2
CO3	Analyze various web-based applications for collaborating everyone in cloud computing	K3
CO4	Assess various industrial platforms for the developments	K4
CO5	Analyze on cloud mobility and governance.	K5

Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
CO1	H	H	H	H	M	M	M	L	M	M	H	H
CO2	H	H	H	H	H	L	M	L	H	L	H	H
CO3	M	M	M	H	M	L	M	M	M	L	H	H
CO4	M	H	M	H	M	L	H	L	M	M	H	H
CO5	H	M	H	H	M	L	M	L	M	H	H	H

Units	Content	Hrs
Unit I	Cloud Computing – Overview: Definition – Basic Concepts – Deployment Models – Service Model – History –Benefits - characteristics	6
Unit II	Cloud Computing Planning: Strategy planning Phase – Cloud computing Tactics Planning Phase – Cloud Computing Deployment Phase – Cloud Computing Technologies- Cloud Computing Architecture	6
Unit III	Cloud Computing Infrastructure- Public Cloud Model – Private Cloud Model – Hybrid Cloud Model – Community Cloud Model – Information as a service	6
Unit IV	Platform as a service – Software as a Service – Identity as a Service – Network as a service-Cloud Computing Management - Cloud Computing Data Storage	6
Unit V	Cloud computing Virtualization – Cloud computing Security- cloud computing operations – Cloud computing Applications – Cloud Computing Providers – Clou computing challenges – Mobile Cloud Computing	6
	Total Contact Hrs	**30**

Pedagogy

Direct Instruction, Flipped Class, Digital Presentation

Assessment Methods:

Seminar, Quiz, Assignments, Group Task.

Text Book

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Tutorial Point (Web Link)	Cloud Computing	Web Link	2016
2	RajkumarBuyya, James Broberg, Andrzej Goscinski	Cloud computing principles and paradigms	Wiley India	2014.

Reference Books

S.NO	AUTHOR	TITLE OF THE BOOK	PUBLISHERS \ EDITION	YEAR OF PUBLICATION
1	Michael Miller	Cloud computing web-based application that change the way you work & collaborate online	Pearson Education	2013
2	Kris Jamsa	Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business	Jones & Bartlett Publishers	2013

Course Designed by	Head of the Department	Curriculum Development Cell	Controller of the Examination
Name and Signature	**Name and Signature**	**Name and Signature**	**Name and Signature**
Dr. E. Rama Devi	Dr. E. Rama Devi	Mr. K. Srinivasan	Dr. R .ManicaChezian
Signature	Signature	Signature	Signature