NEHRU ARTS AND SCIENCE COLLEGE

(An Autonomous Institution affiliated to Bharathiar University)
(Reaccredited with "A" Grade by NAAC, ISO 9001:2015 & 14001:2004 Certified
Recognized by UGC with 2(f) &12(B), Under Star College Scheme by DBT, Govt. of India)
Nehru Gardens, Thirumalayampalayam, Coimbatore - 641 105, Tamil Nadu.

Scheme of Examination

(Applicable to the students admitted during the year 2022-2023)

B. Sc. Computer Science (Data Science)

Semester	Part	Subject Code	Name of the Subject	Instruction hours / week	Duration of Examination	Examination Marks			Credits
						CIA	ESE	Total	
I	I	22U1TAM101/ 22U1HIN101 / 22U1MAL101/ 22U1FRN101	Language I	5	3	50	50	100	4
	II	22U2ENG101	English I	5	3	50	50	100	4
	III	22U3CSC101	Core Paper I: Python Programming	4	3	50	50	100	4
	III	22U3CJC102	Core Paper II: Data Structures	4	3	50	50	100	4
	III	22U3CSP101	Core Paper III: Practical in Python Programming	4	3	50	50	100	4
	III	22U3MKA101	Allied Paper I: Statistics for Computer Science	5	3	50	50	100	4
	IV	22U4ENV101	Ability Enhancement Compulsory Course: Environmental Studies	2	3	50	-	50	2
	IV	22U4HVY201	Value Education: Human Values and Yoga Practice I	1	-	-	-	-	-
				30				**650**	**26**
II	I	22U1TAM202/ 22U1HIN202/ 22U1MAL202/ 22U1FRN202	Language II	5	3	50	50	100	4
	II	22U2ENG202	English II	5	3	50	50	100	4
	III	22U3DTC203	Core Paper IV: Operating System	4	3	50	50	100	4
	III	22U3DTC204	Core Paper V: Object Oriented Programming with Java	4	3	50	50	100	4
	III	22U3DTP202	Core Paper VI: Practical in JAVA Programming	4	3	50	50	100	4

	III	22U3MIA202	Allied Paper II: Discrete Mathematics	5	3	50	50	100	4
	IV	22U4HRC202	Ability Enhancement Compulsory Course: Human Rights and Constitution of India	2	3	50	-	50	2
	IV	22U4HVY201	Value Education: Human Values and Yoga Practice- I	1	2	50	-	50	2
				30				**700**	**28**

Chairman
Board of Studies in Computer Science
Nehru Arts and Science College
Coimbatore

Course Code	Title		
22U3CJC102/ 21U3CJC102	Core Paper II: Data Structures		
Semester: I	Credits: 4	CIA: 50 Marks	ESE:50 Marks
Course Objective	To enable the students to understand about the various techniques such as Linked list, Searching and Sorting, apply them to solve complex programs.		
Course Category	Skill Development		
Development Needs	Global/National /Local/Regional		
Course Description	To understand the concept of Arrays, Stacks, and Queues, Linked list, searching and sorting and apply to solve real world problem using appropriate Data Structure.		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the representation of Arrays, Stacks and Queues.	Lecture	Group Discussion
CO 2	Solve the problems using Queues and List.	Tutorial	Quiz
CO 3	Demonstrate different types of Tree representation and Graph.	Video Lessons	Seminar
CO 4	Design Algorithm to perform different types of Sorting.	Tutorial / Video Lessons	Seminar
CO 5	Illustrate Symbol, hash and File organization, apply to solve real world problem using appropriate Data Structure.	Video Lessons	Assignment

Offered by	Computer Science(Data Science)
Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Introduction:** Overview - Create Programs - Analyze Programs **Arrays:** Axiomatization - Sparse Matrices - Representation of Arrays. **Stacks & Queues:** Fundamentals - Evaluation of Expressions - Multiple Stacks and Queues.	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Write Algorithms for Real time Scenario			**03 Hrs**
II	**Recursion:** Recursive definition and process - recursion in C - Writing Recursive program - simulating Recursion - efficiency of recursion. **Queues and List:** The queue and its sequential representation - Linked list - List in C - An example Simulation using linked list - other list structure.	2	3,4
		Instructional Hours	12
Suggested Learning Methods : Write Algorithms for Real time Scenario			**03 Hrs**
III	**Trees:** Binary Tree - Binary Tree representation - the Huffman algorithm - representing list as Binary - Trees and their applications - Game trees. **Graphs:** A Flow problem - The linked representation of Graph - Graph traversal and spanning forests	2	5,8

		Instructional Hours	12
Suggested Learning Methods : Group Discussion			**03 Hrs**
IV	**Internal Sorting:** Insertion Sort - Quick Sort - 2-Way Merge Sort - Heap Sort - Shell Sort. **External Sorting:** Storage Devices - K-Way Merging- **Sorting With Tapes:** Balanced Merge Sorts - Polyphase Merge.	1	7,8
		Instructional Hours	
Suggested Learning Methods : Group Discussion			**03 Hrs**
V	**Symbol Table:** Static Tree Tables - Dynamic Tree Tables - Hash Tables: Hashing Functions- Overflow Handling. **Files:** Files, Queries and Sequential Organizations- Index Techniques - **File Organization:** Sequential Organization- Random Organization- Linked Organization.	1	9, 10
		Instructional Hours	12
Suggested Learning Methods : Video Presentation			**03 Hrs**
		Total Hours	60 Hrs

Text Books	1. Ellis Horowitz &SartajSahni, **Fundamentals of Data Structures**, Galgotia Publication. 2. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J.Augenstein, **Data Structure using C**, Pearson Education, 2009.
Reference Books	1. Ellis Horowitz, Sartaj Sahni &Sanguthevar Rajasekaran, **Fundamentals of Computer Algorithms**, Galgotia Publications Pvt Ltd, 1999. 2. Jean-Paul Tremblay and Paul G.Sorenson, **An Introduction to Data Structures with Applications**, Second Edition, Tata MaGraw Hill,2008 3. Mark Allen Weiss, **Data Structures and Algorithm Analysis in C**, Florida International University, Pearson Education, Second Edition, 1997.
Web. URLs	

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Class Participation	Assignment	Seminar	Total
8	8	10	8	8	8	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	M	L	M	H	H	H	H	M	M
CO2	H	H	M	M	M	L	M	H	H	H	H	M	M
CO3	H	H	M	M	M	L	M	H	H	H	H	H	H
CO4	H	H	M	M	M	L	M	H	H	H	H	H	H
CO5	H	H	M	M	M	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by

Course Code	Title		
22U3CSC101	Core Paper I : Python Programming		
Semester: I	Credits: 4	CIA:50 Marks	ESE: 50 Marks
Course Objective	To develop algorithmic solutions to simple computational problems using Python		
Course Category	Employability / Skill Development		
Development Needs	Global		
Course Description	Develop Problem Solving Skills to solve the computer based problems at Global needs.		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Understand the basics of Python and write simple Python program.	Lecture / Flipped Classroom	Assignment
CO 2	Develop Python programs using control statement and list method.	Constructivist Approach/ Tutorial	Seminar
CO 3	Apply tuples, Functions, Set iterators to develop simple applications.	Lectures / Video Lessons	Quiz
CO 4	Apply Python Strings, multithreading and exception, Files for problem solving	Tutorial / Case Studies	Program Execution
CO 5	Create applications using Tkinter and Pandas	Lecture / Class Projects	Program Execution

Offered by	Computer Science(Data Science)

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Fundamentals of Python Programming:** Introduction – Features – Applications – Installation-Sample Program-Python Virtual Machine- Memory management in Python-Comparison between C, Java and Python- Keywords, Identifiers, Statements, Indentation. **Syntax and Styles:** Data Types – Literals – Variables-Operators and Expressions-Evaluation of Expression-Sample Programs.	1	1,2
		Instructional Hours	**12**
Suggested Learning Methods : **Video lectures about the basics of Python Programming**			**02 Hrs**
II	**Control Flow:** If – While – For – Break – Continue-Pass-Entry Controlled Loop - Exit Controlled Loop – Counter Controlled Loop - Condition Controlled Loop - Nested Loop - Sample Programs. Arrays-Sequences - Python Lists: Read a List type from a Keyboard-Accessing Elements of a List- Modifying Elements of a List. Basic Operations-Built-in Functions – Python List Methods.	1 2	3,4 ,5 9

		Instructional Hours	12
Suggested Learning Methods : Practice using Flow Charts			**02 Hrs**
III	**Tuples:** Need of a Tuple-Sequence of Unpacking – Methods – Sample programs. Dictionaries: Making a Dictionary-Basic Operations-Dictionary Operations – Sets-Iterators and Generators- Sample Programs. **Functions:** Defining Functions-Calling Functions-Passing Arguments-Keyword Arguments-Default Arguments-Required Arguments-Variable Length Arguments-Return Statements-Nesting of Passing Arguments-Anonymous Functions-Recursive Functions- Scope of Local and Global Variables.	1	6,7,8
		Instructional Hours	12
Suggested Learning Methods : Develop small programmes using tuples			**02 Hrs**
IV	**Strings in Python:** Reading – Accessing – Modifying – Finding- Iterating through a String-Build-in String Functions. Errors and Exceptions-Multithreading **Files and Directory Access:** Files and Streams-Opening a File-Reading/Writing Operations in a File-Other operations in a File	2 1	8 14, 15
		Instructional Hours	
Suggested Learning Methods : Apply the programs in the Python Software			**02 Hrs**
V	**Tkinter:** Introduction-Widget- Label Widget- Button Widget Checkbutton widget- Entry Widget- Listbox Widget-Radiobutton Widget- Scrollbar Widget-Text Widget-Container Widgets. **Pandas:** Pandas Data Frame Basics- Introduction- Concept Map- Objectives- Loading your first Data Set-Looking at Rows, Column and Cell-Grouped and Aggregated calculations-Basic Plots.	1 3	16 1
		Instructional Hours	12
Suggested Learning Methods : Laboratory practice			**02 Hrs**
		Total Hours	60 Hrs

Text Books	1. Ch.Satyanaryana, M.Radhika Mani, B.N. Jagadesh, Python Programming, University Press Pvt. Ltd.2018. 2. Dr.S.A.Kulkarni, Problem Solving and Python Programming, 2nd Edition, Yesdee Publishing,2018 3. Daniel Y.Chen Pandas for everyone. Python Data Analysis, Rough Cuts 2017.
Reference Books	1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers,2016 2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.
Web. URLs	

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
8	8	10	8	8	8	50

Mapping													
CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO 5**
CO1	H	H	H	L	M	M	L	M	M	H	H	M	M
CO2	M	M	M	M	H	M	M	M	H	H	H	M	H
CO3	H	L	M	H	M	M	L	H	M	H	H	M	M
CO4	M	H	L	M	L	L	H	M	H	M	H	H	M
CO5	M	M	H	H	M	H	M	H	H	H	M	H	H
H-High; M-Medium; L-Low													

Course designed by	Verified by

Course Code	Title		
22U3CSP101/ 21U3DTP101	Core Paper III: Practical in Python Programming		
Semester: I	Credits: 4	CIA: 50 Marks	ESE:50 Marks

Course Objective	To introduce the concepts of python programming constructs.
Course Category	Skill Development /Employability
Development Needs	Global/Local
Course Description	To development skill set in python programming and apply the concepts to develop applications in order to meet the Local and Global needs Course Outcomes.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Develop simple Python programs.	Program Demonstration	Program Creativity
CO 2	Understand and apply the concept of control statements.	Program Demonstration	Debugging
CO 3	Apply the concept of looping constructs and functions for solving basic programs.	Program Demonstration	Application of Logic
CO 4	Develop programs for sorting of Strings, Lists, Tuples and File handler.	Program Demonstration	Program Development
CO 5	Create programs using Linear and Binary Search Techniques	Program Demonstration	Program Development

Offered by	**Computer Science(Data Science)**

Course Content	Instructional Hours / Week : 4

Program List

1. Write a python program that displays the following information: Your name, Full Address Mobile, number, College name, Course subjects.
2. Write a python program to find the largest three integers using if-else and conditional operator.
3. Write a python program that asks the user to enter a series of positive numbers (The user should enter a negative number to signal the end of the series) and the program should display the numbers in order and their sum.
4. Write a python program to find the product of two matrices.
5. Write recursive functions for GCD of two integers.
6. Write recursive functions for the factorial of positive integer.
7. Write recursive functions for Fibonacci Sequence upto given number n.
8. Write recursive functions to display prime number from 2 to n.

9. Write a python program that writes a series of random numbers to a file from 1 to n and display.
10. Write a python program to sort a given sequence: String, List and Tuple.
11. Write a python program to make a simple calculator.
12. Write a python program for Linear Search and Binary Search.
13. Write python program in which a function(with single string parameter)is defined and Calling that function prints the string parameters given to function.
14.Write python program in which a class is define, then create object of that class and call Simple print function define in class.

Solving Case studies and Program development	**10 hrs**
Total Hours	60 Hrs

Tools for Assessment (50 Marks)

Laboratory Performance- Application of Logic	Laboratory Performance- Program Creativity	Laboratory Performance- Program Debugging	Test 1	Test 2	Observation Note Book	Total
8	8	8	10	10	6	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	L	M	H	L	M	H	H	H	H	M	M
CO2	H	H	L	M	H	L	M	H	H	H	H	M	M
CO3	H	H	L	M	H	L	M	H	H	H	H	H	H
CO4	H	H	L	M	H	L	M	H	H	H	H	H	H
CO5	H	H	L	M	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by

Course Code	Title		
22U3MKA101	Allied Paper: Statistics for Computer Science		
Semester: I	Credits: 4	CIA:50 Marks	ESE: 50 Marks

Course Objective	To enable the students to learn and visualize the fundamental ideas of statistical methods.
Course Category	Skill Development
Development Needs	Regional
Course Description	Statistics play an intrinsic role in computer science and vice versa. Statistics is used for data mining, speech recognition, vision and image analysis, data compression, artificial intelligence, and network and traffic modelling.

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Implement the basic concepts of measures of Central tendency and dispersion	Smart boards/Chalk & Talk	Assignment
CO 2	Understand the concepts of Correlation and Regression	Group learning	Unit Test
CO 3	Calculate probability using Baye's theorem	Peer teaching	Seminar
CO 4	Know various techniques about random variables	Smart boards/Chalk & Talk	Assignment
CO 5	Analyse the properties of binomial, poisson and normal.	Group learning	Quiz

Offered by	**Mathematics**

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	Statistics – Introduction–Measures of Central tendency- Arithmetic mean- Median-Mode Measures of dispersion – Range-Standard deviation –Quartile deviation- Coefficient of variation	2	7,8
		Instructional Hours	**15**
Suggested Learning Methods : Group Discussion			**02 Hrs**
II	Correlation: Definition –Scatter diagram-Karl Pearson's correlation co-efficient-Rank correlation co-efficient –Properties Regression: Introduction – Construction of regression equations – Properties.	2	10,11
		Instructional Hours	15
Suggested Learning Methods : Problem Solving			**02 Hrs**
III	Probability: Introduction- Axioms of probability- Conditional probability- Addition theorem- Multiplication theorem- Independent event-Conditional probability -Total probability theorem - Baye's theorem.	2	Vol II- 1
		Instructional Hours	15
Suggested Learning Methods : Class Test			**02 Hrs**

IV	Random variables – Discrete random variables-Probability mass function- Continuous random variables – Probability density function Mathematical Expectation – Properties and simple problems on PMF and PDF.	1	5,6
		Instructional Hours	15
Suggested Learning Methods : Seminar			**02 Hrs**
V	Discrete Probability Distributions-Binomial, Poisson, Normal - Simple Problems only.	2	Vol II-2
		Instructional Hours	15
Suggested Learning Methods : Class Test			**02 Hrs**
		Total Hours	60 Hrs

Text Books	1. S.C.Guptha and V.K. Kapoor , **Fundamentals of Mathematical Statistics**, S.Chand and Sons, Reprint, 2009. 2. S P Gupta ,**Statistical methods,** S.Chand and Sons, Reprint, 2017.
Reference Books	1. P.R.Vittal , **Mathematical statistics**, Margham Publications, Chennai
Web. URLs	**https://youtu.be/CVvCvYFoCmM**

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Quiz	Assignment	Seminar	Total
8	8	10	8	8	8	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	L	H	H	H	H	H	L	L	L	L	L
CO2	H	H	L	H	H	H	H	H	M	-	M	-	L
CO3	H	M	L	M	M	H	M	H	L	-	L	-	M
CO4	H	H	L	H	H	H	H	H	M	M	M	L	M
CO5	H	H	L	M	M	H	M	H	M	M	M	L	M

H-High; M-Medium; L-Low

Course designed by	Verified by

Course Code	Title		
22U3CSP202	**Core Paper VI: Practical in JAVA Programming**		
Semester: II	**Credits: 4**	**CIA: 50 Marks**	**ESE:50 Marks**

Course Objective	To enable the students to develop problem solving skills and programming ability in Java.
Course Category	Skill Development /Employability
Development Needs	Global/Local
Course Description	Develop simple and complex applications at Global needs

Course Outcomes		**Teaching Methods**	**Assessment Methods**
CO 1	Develop programs to iimplement the string, array and multiple inheritance concepts.	Program Demonstration	Program Creativity
CO 2	Implement the multithreading, exception handling concepts to solve real world problems	Program Demonstration	Debugging
CO 3	Apply the concept of package to illustrate reusability.	Program Demonstration	Application of Logic
CO 4	Develop the programs for the concepts of Applets and AWT.	Program Demonstration	Program Development
CO 5	Create application for file handling.	Program Demonstration	Program Development

Offered by	**Computer Science(Data Science)**

Course Content	**Instructional Hours / Week : 4**

Program List

1. Write a Java Program to implement Quick Sort Algorithm
2. Write a java program to perform Linear and Binary Search
3. Write a Java Program to implement Stack and Queue Operations
4. Write a Java Applications to extract a portion of a character string and print the extracted string
5. Write a Java program to insert an element (specific position) into an array.
6. Write a Java Program to implement the concept of multiple inheritance using Interfaces
7. Write a program to implement the concept of Exception Handling using predefined exception.
8. Write a Java Program to implement the concept of multithreading with the use of any three multiplication tables and assign three different priorities to them
9. Write a Java program to import classes from user defined package and creating package.

10. Write a Java program for using Graphics classto display basic shapes and fill them, - draw different items using basic shapes, set background and foreground colours.

11. Write a Java Program to create a frame with four text field's name, street, city and pin code with suitable tables. Also add a button called my details. When the button is clicked its corresponding values are to be appeared in the text fields

12. Write a Java program of database connectivity using JDBC-ODBC drivers

Simple Application development	**10 hrs**
Total Hours	60 Hrs

Tools for Assessment (50 Marks)

Laboratory Performance- Application of Logic	**Laboratory Performanc e- Program Creativity**	**Laboratory Performance- Program Debugging**	**Test 1**	**Test 2**	**Observation Note Book**	**Total**
8	**8**	**8**	**10**	**10**	**6**	**50**

Mapping

CO \ PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**
CO1	H	H	L	M	H	L	M	H	H	H	H	M	M
CO2	H	H	L	M	H	L	M	H	H	H	H	M	M
CO3	H	H	L	M	H	L	M	H	H	H	H	H	H
CO4	H	H	L	M	H	L	M	H	H	H	H	H	H
CO5	H	H	L	M	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	**Verified by**

Course Code	Title		
22U3DTC203/ 21U3DTC203	Core Paper IV: Operating Systems		
Semester: II	Credits: 4	CIA: 50 Marks	ESE:50 Marks
Course Objective	To develop the fundamentals of Operating Systems, mechanisms of OS and distributed operating system and implement simple OS mechanisms		
Course Category	Skill Development		
Development Needs	Global/National /Local/Regional		
Course Description	To understand the types, Features, Functions, Process Management of Operating System		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	List the different architectural components involved in OS design	Lecture	Group Discussion
CO 2	Understanding the applications to run in parallel using process	Tutorial	Quiz
CO 3	Learn the mechanism of OS to handle process and threads and their communication	Demonstration	Seminar
CO 4	Develop and implement resource management techniques for timesharing	Video Lessons	Seminar
CO 5	Examine protocols of Distributed OS and file sharing in distributed Applications	Video Lessons	Assignment

Offered by	Computer Science(Data Science)

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Introduction:Types of Operating System**- History of Operating System- **Features of OS- Applications of OS**- Computer Architecture- Hardware Level- Context of a Program- Interrupts	1	1,2
		Instructional Hours	12
Suggested Learning Methods : Write Algorithms for Real time Scenario			**03 Hrs**
II	**Operating System Functions and Structures:** Different Services of Operating System- Uses of System calls- Issue of Portability- User's view of the Operating System- Graphical User Interface- Operating System Structure- Virtual Machine- Booting	2	3
		Instructional Hours	12
Suggested Learning Methods : Write Algorithms for Real time Scenario			**03 Hrs**
III	**Process Management**: – Inter process communication:-The Producer-Consumer Problems-Solutions to the Producer-Consumer Problems-Classical IPC problems- Deadlock-Introduction- Graphical Representation of a Deadlock- Deadlock Prerequisites- Deadlock Strategies	2	6,7
		Instructional Hours	12
Suggested Learning Methods : Group Discussion			**03 Hrs**
IV	**Memory Management:** Single Contiguous Memory Management-Fixed Partitioned Memory Management- Variable Partitions- Paging-Segmentation	2	8

		Instructional Hours	
Suggested Learning Methods : Group Discussion			**03 Hrs**
V	**Case Study:** Unix-History-Overview-File system-Process states and State Transition-Executing and terminating-Booting and login-Process scheduling and memory management	2	13
		Instructional Hours	12
Suggested Learning Methods : Video Presentation			**03 Hrs**
		Total Hours	60 Hrs

Text Books	**1.** Andrew S. Tanenbaum, **Modern Operating System,** Third Edition, Pearson Educational Inc. 2009. 2. Achyut S. Godbole, **Operating System,** TATA McGraw Hill Publishing Company Ltd., Second Edition 2006..
Reference Books	1. William Stallings, **Operating Systems Internals and Design Principles**, Seventh Edition,Pearson Education Inc. 2012 **2.** Abraham Silberchatz, Peter Baer Galvin, Greg Gagne, **Operating System Concepts,**Seventh Edition, Pearson 2009.
Web. URLs	

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
8	8	10	8	8	8	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	M	L	M	H	H	H	H	M	M
CO2	H	H	M	M	M	L	M	H	H	H	H	M	M
CO3	H	H	M	M	M	L	M	H	H	H	H	H	H
CO4	H	H	M	M	M	L	M	H	H	H	H	H	H
CO5	H	H	M	M	M	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by

Course Code	Title		
22U3DTC204/ 21U3DTC204	Core Paper V: Object Oriented Programming with Java		
Semester: II	Credits: 4	CIA: 50 Marks	ESE:50 Marks
Course Objective	To gain knowledge about basic Java language syntax and semantics to write java programs and understand the principles of classes, methods, inheritance, polymorphism and packages.		
Course Category	Skill Development /Employability/Entrepreneurship		
Development Needs	Global/National /Local/Regional		
Course Description	To understand the Object-Oriented Paradigm and develop programs using Control statements and arrays, packages and interfaces, Exception Handling and multithreading and Develop networking applications		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Remember the fundamental concepts of Object-oriented Programming.	Lecture	Class Participation
CO 2	Develop simple Java programs with Control statements and arrays.	Tutorial	Quiz
CO 3	Apply the principles of packages and interfaces.	Demonstration	Seminar
CO 4	Design Java application using the concepts of Applet programming and Graphics Programming.	Video Lessons	Seminar
CO 5	Develop applications using AWT and Database Connectivity.	Video Lessons	Assignment

Offered by	Computer Science(Data Science)

Course Content	Instructional Hours / Week : 4

Unit	Description	Text Book	Chapters
I	**Fundamentals of Object-Oriented Programming:** Object-Oriented Paradigm – Basic Concepts of Object-Oriented Programming – Benefits of Object-Oriented Programming – Application of Object-Oriented Programming. **Java Evolution:** History – Features – How Java differs from C and C++ – Java and Internet – Java and www –Web Browsers. **Overview of Java:** simple Java program – Structure – Java Tokens – Statements – Java Virtual Machine	1	1,2,3
		Instructional Hours	**12**
Suggested Learning Methods : Code Debugging			**03 Hrs**
II	Constants, Variables, Data Types, Operators and Expressions, **Decision Making and Branching:** if, if...else, nested if, switch, ? : Operator, **Decision Making and Looping:** while, do, for – Jumps in Loops – Labelled Loops, Classes, Objects and Methods. **Arrays:** One Dimensional Array-Creating an Array- Two Dimensional Array.	1	4,5,6,7 & 8
		Instructional Hours	12
Suggested Learning Methods : Code Debugging			**03 Hrs**
III	**Inheritance, Interfaces, Packages:** Putting Classes together,		10,11

	Exception Handling, Multithreaded Programming,	1	& 12
		Instructional Hours	12
Suggested Learning Methods : Simple Application Development			**03 Hrs**
IV	**Applet Programming, Graphics Programming**	1	13,14 &15
		Instructional Hours	
Suggested Learning Methods : Simple Application Development			**03 Hrs**
V	**GUI using Java AWT:** What is AWT in Java, Class Hierarchy Layout Manager, Label class, Text Field class, Button Class, Choice class, List Class, Checkbox Class. **Database Access Using JDBC and SQL:** Database Basics, Client-Server System-Two- tier, Three-tier, Multi-tier system, Database Access and Java – What does JDBC do – JDBC Components – Creating a Table – Data Retrieval – Examples.	2	6, 21
		Instructional Hours	12
Suggested Learning Methods : Simple Application Development			**03 Hrs**
		Total Hours	60 Hrs

Text Books	1. E. Balagurusamy, **Programming with Java – A Primer**, Tata McGraw Hill Publication, 3rd Edition, 2007 2. Keyur Shah, Java 2 Programming, Tata McGraw – Hill Publication, 2007.
Reference Books	1. Patrick Naughton & Hebert Schildt, **The Complete Reference Java 2,** Tata McGraw Hill Publication, 3rd Edition , 2002. **2.** John R. Hubbard, **Programming with Java,** Tata McGraw Hill Publication,2nd Edition,2009
Web. URLs	

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Assignment	Seminar	Quiz	Total
8	8	10	8	8	8	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	L	M	H	L	M	H	H	H	H	M	M
CO2	H	H	L	M	H	L	M	H	H	H	H	M	M
CO3	H	H	L	M	H	L	M	H	H	H	H	H	H
CO4	H	H	L	M	H	L	M	H	H	H	H	H	H
CO5	H	H	L	M	H	L	M	H	H	H	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by

Course Code	Title		
22U3MIA202	Allied Paper II : Discrete Mathematics		
Semester: II	Credits: 4	CIA: 50 Marks	ESE:50 Marks
Course Objective	To learn about the discrete structure for computer based application.		
Course Category	Skill Development		
Development Needs	Regional		
Course Description	This course is to understand and use abstract discrete structures that are backbones of computer science. In particular, this course meant to introduce logic, proofs, sets, relations, functions, counting, and graph with an emphasis on applications in computer science.		

Course Outcomes		Teaching Methods	Assessment Methods
CO 1	Learn the basic concepts of Set theory	Chalk & Talk	Unit Test
CO 2	Implement the basic ideas of Mathematical Logic in Computer Science	Peer Teaching/ Chalk & Talk	Assignment
CO 3	Classify different types of Relations and Functions	Chalk & Talk	Seminar
CO 4	Infer the concepts of Grammar and Automata theory.	GLM/ Chalk & Talk	Unit Test
CO 5	Know the concepts of Graph theory	Chalk & Talk	Quiz

Offered by Mathematics

Course Content — **Instructional Hours / Week : 4**

Unit	Description	Text Book	Chapters
I	**Set Theory:** Introduction-Set & its Elements-Set Description-Types of sets-Venn-Euler Diagrams-Set operations & Laws of set theory. Fundamental products- Partitions of sets – Min sets- Algebra of sets and Duality-Inclusion and Exclusion Principle	1	1
		Instructional Hours	**15**
Suggested Learning Methods : Problem Solving Practise			**03 Hrs**
II	**Mathematical Logic:** Introduction- prepositional calculus – Basic logical operations- Tautologies-Contradiction – Argument-PDNF & PCNF - Method of proof.	1	12
		Instructional Hours	**15**
Suggested Learning Methods : Class Test			**03 Hrs**
III	**Relations:** Binary Relations – Set operation on relations-Types of Relations – Partial order relation – Equivalence relation – Composition of relations. Functions – Types of functions – Invertible functions – Composition of functions.	1 1	3 4
		Instructional Hours	**15**
Suggested Learning Methods : Seminar			**03 Hrs**
IV	**Languages:**Operations on languages – Regular Expressions and regular languages. **Grammar:**Types of grammars – Grammar Construction-Finite state machine –Finite State Automata- DFA- NDFA- Conversion of NDFA into DFA**.**	1	15

	Instructional Hours		**15**
Suggested Learning Methods : Quiz			**03 Hrs**
V	**Graph Theory:** Basic terminology – paths, cycle & Connectivity – Sub graphs – Types of graphs.	1	9
	Trees – Properties of trees – Binary trees-Traversal of Binary Trees.	1	10
	Instructional Hours		12
Suggested Learning Methods : Problem Solving Practise			**03 Hrs**
	Total Hours		60 Hrs

Text Books	1. J.K. Sharma, **Discrete Mathematics**, Macmillan India Ltd, 2nd edition, 2005. Unit I : Chapter 1, Section: 1.1-1.7, 1.9,1.10, 1.12, 1.14 Unit II : Chapter 12, Section: 12.1 – 12.3 & 12.8, 12.9, 12.11, 12.12 & 12.14 Unit III : Chapter 3, Section: 3.3 - 3.7, 3.11 Chapter 4, Section: 4.1 – 4.5 Unit IV : Chapter 15, Section: 15.1-15.7 Unit V : Chapter 9, Section: 9.1 – 9.5 Chapter 10, Section: 10.1-10.3
Reference Books	1. J. P. Tremblay, R. Manohar, **Discrete Mathematics Structures with Applications to Computer Science,**McGraw Hill International Edition, 2005. 2. T.Veerarajan, **Discrete Mathematics with Graph Theory and Combinatorics,** McGraw Hill International Edition, 2008
Web. URLs	**1.** https://www.youtube.com/watch?v=oaOm2pnKkyY 2. https://www.bing.com/ck/a?!&&p=15aa8c6b70a85b80JmltdHM9MTY2MTQyMjE4OSZpZ3VpZD01MDI3YjUxZS00ZDBiLTQ2ODEtYjUyZS0yZjdhNzU3MGY1NWMmaW5zaWQ9NTQ3OQ&ptn=3&hsh=3&fclid=0d43c102-245e-11ed-9fcf-eb6827fef90b&u=a1L3ZpZGVvcy9zZWFyY2g_cT1EaXNjcmV0ZSttYXRocyt5b3V0dWJlK2xpbmsrZnJvbStJSXQmZG9jaWQ9NjA4MDEyMDk3OTA4NzkxNzAwJm1pZD0wMjVENkM3NUZBNDEwOEY0QTAxNTAyNUQ2Qzc1RkE0MTA4RjRBMDE1JnZpZXc9ZGV0YWlsJkZPUk09VklSRQ&ntb=1

Tools for Assessment (50 Marks)

CIA I	CIA II	CIA III	Class Praticipation	Assignment	Quiz	Total
8	8	10	8	8	8	50

Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	L	M	H	M	M	M	L	M	H	M	M
CO2	H	H	L	M	H	M	M	H	L	L	H	L	M
CO3	H	H	L	M	H	M	M	H	M	M	H	H	H
CO4	H	H	L	M	M	M	M	M	L	M	H	M	M
CO5	H	H	L	H	M	M	M	H	M	M	H	H	H

H-High; M-Medium; L-Low

Course designed by	Verified by