CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK

B.Sc Computer Science (Artificial Intelligence)

(Those who have joined in the Academic year 2024-25 onwards)

Programme:	**U.G.**
Programme Code:	57
Duration:	**3 years [UG]**
Programme Outcomes:	**PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one*** NSS / NCC / Physical Education / Rovers and Rangers / Library Science** s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups. **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyze and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development. **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations. **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints. **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesizing and articulating; Ability to recognize cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyze, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team **PO8: Scientific reasoning**: Ability to analyze, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes:	**PSO1:** Exhibit good domain knowledge and completes the assigned responsibilities effectively and efficiently in par with the expected quality standards for Artificial Intelligence profession. **PSO2:** Apply the technical and critical thinking skills in the discipline of Artificial Intelligence to find solutions for complex problems. **PSO3:** Design and develop research-based solutions for complex problems in Artificial Intelligence industry through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns. **PSO4:** Understand, formulate, develop programming model with logical approaches to address issues arising in Artificial Intelligence, business and other contexts. **PSO5:** Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Artificial Intelligence.

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
PSO 1	S	S	S	S	S	S	S	S
PSO 2	S	S	S	M	M	M	L	L
PSO3	S	S	S	M	M	L	L	M
PSO 4	S	S	S	S	M	M	M	L
PSO 5	S	S	S	S	M	M	L	L

S – Strong, M- Medium, L- Low

CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK

B.Sc Computer Science (Artificial Intelligence)

Part	Courses	Subject	Code	Cr.	Hrs
SEMESTER I					
I	Lang. – I	nghJj;jkpo; - I	230103101	3	6
II	Lang. - II	General English	231003101	3	4
III	CC – 1	Programming in C	235703101	4	5
	CC – 2	Programming in C Lab	235703102	4	5
	EC – I	Discrete Mathematical Structure	233103122	3	4
IV	SEC –I(NME)	Fundamentals of Computers	234603157	2	2
IV	FC	Problem Solving Techniques	234403157	2	2
	AECC - I	Soft Skill - I	236003101	2	2
	Total			**23**	**30**
SEMESTER II					
I	Lang. -I	nghJj;jkpo; - II	230103201	3	6
II	Lang. -II	General English	231003201	3	4
III	CC – 3	Java Programming	235703201	4	5
	CC - 4	Java Programming Lab	235703202	4	5
	EC – II	Numerical Methods	233103222	3	4
. IV	SEC –II(NME)	Fundamentals of Information Technology	234603257	2	2
	SEC - III	Advanced Excel Lab	234403257	2	2
	AECC –II	Soft Skill - II	236003201	2	2
				23	**30**
SEMESTER III					
I	Lang. -I	nghJj;jkpo; - III	230103301	3	6
II	Lang. -II	General English	231003301	3	4
III	CC – 5	Data Structure and Computer Algorithms	235703301	4	5
	CC - 6	Data Structure and Computer Algorithms Lab	235703302	4	4
	EC –3	Mathematical Statistics	233103323	3	4
IV	SEC –IV	E-Commerce	234403327	1	2
	SEC – V	Bio Metrics	238203327	2	2
	AECC – III Soft skill – 3	Soft Skill - 3	236003301	2	2
	EVS	Environmental Studies	234103301	1	1
				23	**30**

Part	Courses		Code	Cr.	Hrs
SEMESTER IV					
I	Lang. – I	nghJj;jkpo; - IV	230103401	3	6
II	Lang. - II	General English	231003401	3	4
III	CC – 7	Python Programming	235703401	4	5
	CC - 8	Python Programming Lab	235703402	4	4
	EC – IV	Data Communication & Computer Networks	235703403	3	4
		Operating System	235703404		
IV	SEC –VII	Open Source Software Technologies	234403457	2	2
IV	SEC –VIII	Web Technology Lab	238203457	2	2
	AECC	Soft Skill - IV	236003401	2	2
	EVS	Environmental Studies	234103401	1	1
V		Extension Activity **	-	1	-
	Total			**25**	**30**
SEMESTER V					
III	CC – 9	Relational Database Management System	235703501	4	5
	CC - 10	RDBMS Lab Using ORACLE	235703502	4	5
	CC - 11	Machine Learning	235703503	4	5
	Core 12	Project with Viva Voice	235703504	4	4
	EC – V	Software Engineering	235703505	3	5
		Financial analytics	235703506		
	EC – VI	Information Security	235703507	3	5
		Software Metrics	235703508		
IV		Value Education	234303501	1	1
		Internship/Industrial Training(carried out in II year summer vacation)30 hrs*	235703509	2	-
				25	**30**
SEMESTER VI					
III	CC – 13	IOT and Cloud Technologies	235703601	4	5
	CC – 14	IOT and Cloud Technologies Lab	235703602	4	5
	CC – 15	Artificial Intelligence	235703603	4	5
	EC –7	Data Mining and Warehousing	235703604	3	5
		Computing Intelligence	235703605		
	EC - 8	Robotics and Applications	235703606	3	5
		Artificial Neural Networks	235703607		
IV	Professional competency skill enhancement course	Quantitative Aptitude	235703608	2	4
		Value Education	234303601	1	1
				21	**30**

****** Physical Education – 235003401 / NCC – 235103401 / NSS – 235203401 / Rovers and Rangers - 235303401 / Library Science - 235403401

*****Internship will be carried out during the summer vacation of the Second year and marks will be included in the Fifth Semester Marks Statement.

Title of the Course		**PROGRAMMING IN C**						
Part		**III**						
Category	Core – 1	**Year**	I	**Credits**	4	**Course Code**	**235703101**	
		Semester	I					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		5	-	--	5	25	75	100

Learning Objectives	
LO1	To familiarize the students with the understanding of code organization
LO2	To improve the programming skills
LO3	Learning the basic programming constructs.

UNIT	**Details**	**No. of Periods for the Unit**
I	**Studying Concepts of Programming Languages**- Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations	**15**
II	**Decision Making and Branching**: Decision Making and Looping - Arrays - Character Arrays and Strings	**15**
III	**User Defined Functions:** Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions- Recursion	**15**
IV	**Structures and Unions:** Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.	**15**
V	**Pointers:** Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- **File Management in C**	**15**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Outline the fundamental concepts of C programming languages, and its features
CO2	Demonstrate the programming methodology.
CO3	Identify suitable programming constructs for problem solving.
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.
CO5	Evaluate the program performance by fixing the errors.

Text Books	
1	Robert W. Sebesta, (2012), ―Concepts of Programming Languages‖, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)
2	E. Balaguruswamy, (2010), ―Programming in ANSI C‖, Fifth Edition, Tata McGraw Hill Publications
References Books	
1	Ashok Kamthane, (2009), ―Programming with ANSI & Turbo C‖, Pearson Education
2	Byron Gottfried, (2010), ―Programming with C‖, Schaums Outline Series, Tata McGraw Hill Publications

Web Resources	
1	http://www.tutorialspoint.com/cprogramming/
2	http://www.cprogramming.com/
3	http://www.programmingsimplified.com/c-program-examples
4	http://www.programiz.com/c-programming
5	http://www.cs.cf.ac.uk/Dave/C/CE.html
6	http://fresh2refresh.com/c-programming/c-function/

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO1	**S**	**M**	**M**	**S**	**M**	**M**
CO2	**S**	**S**	**M**	**S**	**M**	**M**
CO3	**S**	**S**	**S**	**S**	**M**	**M**
CO4	**S**	**S**	**M**	**S**	**M**	**M**
CO5	**S**	**S**	**M**	**S**	**M**	**M**

S-Strong, M-Medium, L-Low

Title of the Course		**PROGRAMMING IN C LAB**						
Part		**III**						
Category	Core – 2	**Year**	I	**Credits**	4	**Course Code**		**235703102**
		Semester	I					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		-	-	5	5	25	75	100

Learning Objectives	
LO1	The Course aims to provide exposure to problem-solving through C programming
LO2	It aims to train the student to the basic concepts of the C -Programming language
LO3	Apply different concepts of C language to solve the problem

List of Exercises

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

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Demonstrate the understanding of syntax and semantics of C programs.
CO2	Identify the problem and solve using C programming techniques.
CO3	Identify suitable programming constructs for problem solving.
CO4	Analyze various concepts of C language to solve the problem in an efficient way.
CO5	Develop a C program for a given problem and test for its correctness.

Title of the Course		**FUNDAMENTALS OF COMPUTERS**						
Part		**IV**						
Category	SEC I NME	**Year**	I	**Credits**	2	**Course Code**	**234603157**	
		Semester	I					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		2	-	--	2	25	75	100

Learning Objectives	
LO1	Discuss the Introduction about Computer and its Components.
LO2	To Perform the Microsoft Word operations.
LO3	To get Knowledge about the Microsoft Excel.
LO4	To learn about PowerPoint Presentation.
LO5	To get knowledge about Internet and E-Mail.

UNIT	**Details**	**No. of Periods for the Unit**
I	**Introduction to Computers:** Generations of Computer – Data and Information – Components of Computer – Software – Hardware – Input Devices – Output Devices.	**15**
II	**MS word:** Introduction – Elements of window – files, Folders and Directories – Text Manipulating: Cut, Copy, Past, Drag and Drop – Text Formatting: Font – Style, Size, Face and Colors(both foreground and background) – alignment – Bullets and Numbering – Header and footer – watermark – inserting objects (images, other applications document) – Table creation.	**15**
III	**MS Excel:** Introduction – Inserting rows and columns – Sizing rows and columns – Implementing formulas – Generating series – creation of chart – Filter – Sorting.	**15**
IV	**MS PowerPoint:** Introduction – Slides Manipulations (Inserting new, copy, past, delete and duplicate slides)- Slide show – Types of views – Types of Animations – Inserting objects – Implementing multimedia (Video and Audio).	**15**
V	**Internet:** Introduction to Internet – Services of Internet – domain Name – URL – Browser – Types of Browsers – search Engine – E-Mail – basic Components of E-Mail .	**15**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Understand the basics of computer and its Generations. Be able to understand the components of computer.
CO2	To understand the introduction about MS word. Be able to perform the Elements of window, Text formatting Text Manipulating options in MS word.
CO3	To understand the introduction about MS Excel. Be able to inserting and sizing the cell Implementing formulas and inserting worksheet.
CO4	To understand the introduction about MS Powerpoint. Be able to perform the slides manipulation. Implementing Multimedia and templates.
CO5	To understand the introduction about internet and Intranet. Be able to access the browser. To get knowledge about basic components of E-Mail.

Text Books	
1	G.Manjunath, - computer Basics, Vasan Publication,2010.
2	Pradeep K. Sinha & Pritisinha – Computer Fundamentals, 6th Edition, BPB Publications,2004.

References Books	
1	BhardwajsushilPuneet Kumar, - fundamental of Information Technology
2	GG WILKINSON – Fundamentals of Information Technology, Wiley-Blackwell
3	A Ravichandran, - fundamentals of Information Technology, Khanna Book Publishing.
Web Resources	
1	https://www/tutorialspoint.com/computer_fundamentals/index.htm
2	https://www/tutorialspoint.com/basics_of_computers/index.htm
3	https://www/tutorialspoint.com/word/index.htm
4	https://www/tutorialspoint.com/excel/index.htm
5	https://www/tutorialspoint.com/powerpoint/index.htm

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	**S**	**S**	**S**	**S**	**S**	**S**
CO2	**S**	**M**	**M**	**S**	**S**	**M**
CO3	**M**	**S**	**S**	**S**	**S**	**S**
CO4	**S**	**S**	**M**	**S**	**S**	**S**
CO5	**S**	**S**	**S**	**S**	**M**	**S**

S-Strong; M-Medium; L-Low

Title of the Course		**PROBLEM SOLVING TECHNIQUES**						
Part		**IV**						
Category	FC	**Year**	I	**Credits**	2	**Course Code**	**234403157**	
		Semester	I					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		2	-	--	2	25	75	100

Learning Objectives	
LO1	Familiarize with fundamentals of Computers and Programming Languages.
LO2	Familiarize with writing of algorithms, Implement different programming constructs.
LO3	Use data flow diagram.
LO4	Define and use of arrays with simple applications.
LO5	Understand about program modules and their uses.

UNIT	**Details**	**No. of Periods for the Unit**
I	**Introduction:** History, characteristics and limitations of Computer-Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices-Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer-Software: System software and Application software. **Programming Languages:** Machine language, Assembly language, High- level language,4 GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.	**6**
II	**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts. **Pseudocode:** Writing a pseudocode-Coding, documenting and testing a program-Comment lines and types of errors. **Program design:** Modular Programming.	**6**
III	**Data:** Numeric Data and Character Based Data. **Data Flow Diagrams:** Definition, DFD symbols and typesof DFDs.	**6**
IV	**Arrays:** One Dimensional Array - Two Dimensional Arrays – Stringsas Arrays of Characters.	**6**
V	**Program Modules:** Subprograms-Value and Reference parameters- Scope of a variable - Functions –Recursion.	**6**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Study the basic knowledge of Computers.Analyze the programming languages.
CO2	Know about the algorithms. Develop program using flow chart and pseudocode.
CO3	Explain about data & DFD
CO4	Analyze about Arrays.
CO5	Creating subprograms & functions.

Text Books	
1	R. G. Dromey, *How to Solve it by Computer*, Pearson India, 2007.

References Books	
1	George Polya, Jeremy Kilpatrick, *The Stanford Mathematics Problem Book: With Hintsand Solutions*, Dover Publications, 2009 (Kindle Edition 2013).
2	Greg W. Scragg, *Problem Solving with Computers*, Jones & Bartlett 1st edition, 1996.
Web Resources	
1	Web resources from NDL Library, E-content from open-sourcelibraries

Mapping with Programme Outcomes:

CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**
CO 1	S	S	S	S	S	S
CO 2	S	S	S	S	S	S
CO 3	S	M	S	S	S	S
CO 4	S	S	M	S	S	M
CO 5	S	S	S	S	S	S

S-Strong; M-Medium; L-Low

Title of the Course		**JAVA PROGRAMMING**						
Part		**III**						
Category	Core – 3	**Year**	I	**Credits**	4	**Course Code**	**235703201**	
		Semester	II					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		5	-	--	5	25	75	100

Learning Objectives	
LO1	To provide fundamental knowledge of object-oriented programming.
LO2	To equip the student with programming knowledge in Core Java from the basics up.
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.

UNIT	**Details**	**No. of Periods for the Unit**
I	**Introduction:** Review of Object Oriented concepts – History of Java – Java buzzwords – JVM architecture - Datatypes - Variables - Scope and life time of variables - arrays - operators – control statements - type conversion and casting - simple java program - constructors - methods - Static block - Static Data - Static Method String and String Buffer Classes	**15**
II	**Inheritance**: Basic concepts - Types of inheritance - Member access rules - Usage of this and Super key word - Method Overloading - Method overriding - Abstract classes - Dynamic method dispatch - Usage of final keyword. **Packages**: Definition-Access Protection-Importing Packages. **Interfaces**: Definition –Implementation–Extending Interfaces. Exception Handling: ***try – catch - throw - throws – finally –*** **Built-in exceptions - Creating own Exception classes.**	**15**
III	**Multithreaded Programming**: Thread Class - Runnable interface – Synchronization–Using synchronized methods– Using *synchronized* statement- Inter Thread Communication –Deadlock. **I/O Streams:** Concepts of streams - Stream classes- Byte and Character stream - Reading console Input and Writing Console output - File Handling.	**15**
IV	**AWT Controls:** The AWT class hierarchy - user interface components- Labels - Button - Text Components - Check Box - Check Box Group - Choice - List Box - Panels – Scroll Pane - Menu - Scroll Bar. Working with Frame class - Colour - Fonts and layout managers. **Event Handling:** Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events - Adapter classes - Inner classes.	**15**
V	Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JText Area - JList – Jcombo Box – Jscroll Pane	**15**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3	Implement multi-threading and I/O Streams of Core Java
CO4	Implement AWT and Event handling.
CO5	Use Swing to create GUI.

Text Books	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7thEdition, 2010.
2	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.
References Books	
1	Head First Java, O"Rielly Publications,
2	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.
Web Resources	
1	Java Basics: 1. www.tutorialspoint.com/java/index.html 2. www.w3schools.com/java 3. https://www.geeksforgeeks.org/java-tutorial/
2	AWT: 1. www.javatpoint.com/java-awt 2. www.javatpoint.com/awt-program-in-java 3. https://www.geeksforgeeks.org/java-tutorial/
3	Swing: 1. www.javatpoint.com/java-swing 2. www.tutorialspoint.com/swing/index.htm 3. https://www.geeksforgeeks.org/introduction-to-java-swing/

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	S	M	S	M	M	S
CO 2	S	L	S	M	S	L
CO 3	M	S	L	M	M	S
CO 4	L	S	S	L	S	M
CO 5	S	M	M	S	L	S

S-Strong; M-Medium; L-Low

Title of the Course		**JAVA PROGRAMMING LAB**						
Part		**III**						
Category	Core – 4	**Year**	I	**Credits**	4	**Course Code**	**235703202**	
		Semester	I					

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
	--	-	5	5	25	75	100

Learning Objectives

LO1	To gain practical expertise in coding Core Java programs
LO2	To become proficient in the use of AWT, Event Handling and Swing.

List of Exercises

1. Write a Java program that prompts the user for an integerand then prints out all the prime numbers up to that Integer?

2. Write a Java program to multiply two given matrices.

3. Write a Java program that displays the number ofcharacters, lines and words in a text?

4. Generate random numbers between two given limits using Random class and print messages according to the range of the value generated.

5. Write a program to do String Manipulation using Character Array and perform the following string operations.
   a) String length
   b) Finding a character at a particular position
   c) Concatenating two strings

6. Write a program to perform the following string operations using String class:
   a) String Concatenation
   b) Search a substring.
   c) To extract substring from given string.

7. Write a program to perform string operations using String Buffer class.
   a) Length of a string
   b) Reverse a string
   c) Delete a substring from the given string

8. Write a java program that implements a multi-thread application that has three threads. First thread generatesrandom integer every 1 second and if the value is even,second thread computes the square of the number and prints. If the value is odd, the third thread will print thevalue of cube of the number.

9. Write a threading program which uses the same method asynchronously to print the numbers 1 to 10 using Thread1 and to print 90 to 100 using Thread2.

10. Write a program to demonstrate theuse of following exceptions.
    a. Arithmetic Exception
    b. Number Format Exception
    c. Array Index Out of Bound Exception
    d. Negative Array Size Exception

11. Write a Java program that reads on file name from theuser, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes?

12. Write a program to accept a text and change its size and font. In clude bold italic options. Use frames and controls.

13. Write a Java program that handles all mouse events andshows the event name at the center of the window whena mouse event is fired. (Use adapter classes).

14. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and forthe +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.

15. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or"go" should appear above the buttons in a selected color. Initially there is no message shown.

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Code, debug and execute Java programs to solve the given problems
CO2	Implement multi-threading and exception-handling
CO3	Implement functionality using String and String Buffer classes
CO4	Demonstrate Event Handling.
CO5	Create applications using Swing and AWT

Text Books	
1	Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7thEdition, 2010.
2	Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999
References Books	
1	Head First Java, O"Rielly Publications,
2	Y. Daniel Liang, *Introduction to Java Programming*, 7th Edition, Pearson Education India, 2010.

Web Resources	
1	Web resources from NDL Library, E-content from open-source libraries

Title of the Course		**FUNDAMENTALS OF INFORMATION TECHNOLOGY**						
Part		**IV**						
Category	SEC - II NME	**Year**	I	**Credits**	2	**Course Code**	**234603257**	
		Semester	II					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		2	-	--	2	25	75	100

Learning Objectives	
LO1	Understand basic concepts and terminology of information technology.
LO2	Have a basic understanding of personal computers and their operation
LO3	Be able to identify data storage and its usage
LO4	Get great knowledge of software and its functionalities
LO5	Understand about operating system and their uses

UNIT	**Details**	**No. of Periods for the Unit**
I	**Introduction to Computers:** Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer,Capabilities and limitations of computer	**6**
II	**Basic Computer Organization:** Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	**6**
III	**Storage Fundamentals:** Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	**6**
IV	**Software:** Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	**6**
V	**Operating System:** Functions, Measuring System Performance, Assemblers, Compilersand Interpreters.Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	**6**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Learn the basics of computer, Construct the structure of the required things incomputer, learn how to use it.
CO2	Develop organizational structure using for the devices present currently underinput or output unit.
CO3	Concept of storing data in computer using two header namely RAM andROM with different types of ROM with advancement in storage basis.
CO4	Work with different software, Write program in the software and applicationsof software.
CO5	Usage of Operating system in information technology which really acts as ainterpreter between software and hardware.

Text Books	
1	Anoop Mathew, S. KavithaMurugeshan (2009), " Fundamental of Information Technology", Majestic Books.
2	Alexis Leon, Mathews Leon," Fundamental of Information Technology", 2nd Edition.
3	S. K Bansal, "Fundamental of Information Technology".
References Books	
1	BhardwajSushilPuneet Kumar, "Fundamental of Information Technology"
2	GG WILKINSON, "Fundamentals of Information Technology", Wiley-Blackwell
3	A Ravichandran , "Fundamentals of Information Technology", Khanna Book Publishing
Web Resources	
1	https://testbook.com/learn/computer-fundamentals
2	https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html
3	https://www.javatpoint.com/computer-fundamentals-tutorial
4	https://www.tutorialspoint.com/computer_fundamentals/index.htm
5	https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf

Mapping with Programme Outcomes:

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	S	S	S	S	S	S
CO 2	S	S	S	S	S	S
CO 3	S	S	S	S	S	S
CO 4	S	S	S	S	M	S
CO 5	S	s	M	S	S	M

S-Strong; M-Medium; L-Low

Title of the Course		**ADVANCED EXCEL LAB**						
Part		**IV**						
Category	SEC - III	**Year**	I	**Credits**	2	**Course Code**	**234403257**	
		Semester	II					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		-	-	2	2	25	75	100

Learning Objectives

- ✍ Familiarize with the constructs and running of Excel programs.
- ✍ Apply Excel to solve financial problems.
- ✍ Demonstrate the working of various functions supported by Excel

LIST OF EXERCISES

1. Writing conditional expressions (using IF)
2. Using logical functions (AND, OR, NOT)
3. Using lookup and reference functions (VLOOKUP, HLOOKUP, MATCH, INDEX) VlookUP with Exact Match, Approximate Match
4. Specifying a valid range of values for a cell
5. Specifying custom validations based on formula for a cell
6. Sorting tables
7. Pivot tables
8. Using multiple-level sorting
9. Filtering data for selected view (AutoFilter) Using advanced filter options
10. Working with Reports
11. Using Charts Formatting Charts

References Books

Alan Murray, Advanced Excel Success A Practical Guide to Mastering Excel 2020, Apress publisher, 2020

Michael Alexander and Dick Kusleika , Microsoft Excel 365 Bible Wiley publications, 2022

Web Resources

https://support.microsoft.com/en-us/office/video-advanced-formulas-and-references-2225a2be-7a49-4fa5-91bb-5941c20653e5

https://corporatefinanceinstitute.com/resources/excel/advanced-excel-formulas-must-know/

https://support.microsoft.com/en-us/excel

Title of the Course		**DISCRETE MATHEMATICAL STRUCTURES (Allied Mathematics for Computer Science(Artificial Intelligence) and Computer Science (Cloud Computing and Cyber Security)students**						
Part		**III**						
Category	EC I	**Year**	I	**Credits**	3	**Course Code**	**233103122**	
		Semester	I					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		4	--	--	4	25	75	100

Learning Objectives		
	To understand the mathematical concepts like set theory, logics, number theory, combinatory and relations.	
UNIT	**Details**	**No. of Periods for the Unit**
I	**SET THEORY** Introduction- Set and Its Elements – Set Description (Roster, Set Builder and cardinal number method) Types of Sets- Set Operations and Laws of set Theory. Partition of sets. Minsets-Countable and uncountable set. Algebra of sets and Duality **Book 2: chapter 1 – Section 1.1 to 1.4, 1.6 & 1.9 to 1.12** **Page No: 1to 6 , 10 to 17, 20 to 30**	**12**
II	**MATHEMATICAL LOGIC** Basic Logic and Proof, logical operations – Logic Propositional equivalence, Predicates and Quantities, Tautology-Contradiction-Methods of proofs (Direct and Indirect)- Function- Definition-Notation- Types of Functions- Composition of Functions. Book 1: chapter 1- Section 1.1, 1.2, 1.3 (pag.no: 1to 45) Book 2: chapter 4 – Section 4.2, 4.3, 4.5 (page no: 109 to 115, 120,121)	**12**
III	**NUMBER THEORY** The Integers and Division, Integers and Algorithms, (Multiplication, Addition and Division) - Sequencesand Summations, Recursive algorithms,Program correctness. Book 1: Chapter 2 – Section 2.5; Chapter 3- Section 3.4,3.6; Chapter 4- Section 4.4 Page No: 161 to 175, 215 to 222, 231 to 242, 318 to 328.	**12**
IV	**COMBINATORICS:** The basics of counting, the pigeonhole principle, Permutations and Combinations, Binomial coefficients, Generalized permutations and combinations. **Book 1: Chapter 5: Section 5.1 to 5.5** **Page No: 335 to 380**	**12**
V	***RELATIONS*** Relations – Relations and their properties, Representing Relations, Closures of relations, Equivalence relations, Partial ordering-Recurrence Relations. **Book1: chapter 6: Section 6.1; Chapter 7: section 7.1,7.3 to 7.6** **Page No: 391 to 400, 459 to 468, 476 to 520**	**12**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	To gain knowledge on set theory
CO2	To understand different mathematical logics and functions
CO3	To get an idea on Permutations and Combinations
CO4	To understand the different form of number theory
CO5	to understand Relations and its applications

Text Books	
1	Rosen K.H. Discrete Mathematics and its Applications, 5th edition, Tata McGraw – Hills,2003.
2	J.K Sharma "DISCRETE MATHEMATICS" 3rd Edition Macmillan Reprint 2011

References Books	
1	Johnson Baugh R, and Carman R, Discrete mathematics, 5th edition, PersonEducation, 2003.
2	Kolman B, Busoy R.C, and Ross S.C, Discrete Mathematical Structures,5th edition, Pretitice – Hall,2004.
3	Mott J.L, Kandel A, and Bake T.P, Discrete Mathematics for ComputerScientists & Mathematicians, 2nd edition, Prentice-Hall of India,2002.

Web Resources	
1	Web resources from NDL Library, E-content from open-source libraries

Mapping with Programme Outcomes: Mapping with Programme Specific Outcomes:

CO/PSO	**POs**						**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**1**	**2**	**3**
CO1	S	M	S	S	M	S	S	M	L
CO2	S	S	M	S	S	S	S	L	M
CO3	S	S	S	S	S	S	S	M	L
CO4	S	S	S	S	S	M	S	M	L
CO5	S	S	M	S	S	S	S	M	L

S-Strong M-Medium L-Low

Title of the Course		**NUMERICAL METHODS (Allied Mathematics for Computer Science(Artificial Intelligence) and Computer Science (Cloud Computing and Cyber Security)students**						
Part		**III**						
Category	EC II	**Year**	I	**Credits**	3	**Course Code**	**233103222**	
		Semester	II					
Instructional Hours per week		**Lecture**	**Tutorial**	**Lab Practice**	**Total**	**CIA**	**External**	**Total**
		4	--	--	4	25	75	100

Learning Objectives	
LO1	To introduce the various topics in Numerical methods.
LO2	To make understand the fundamentals of algebraic equations.
LO3	To apply interpolation and approximation on examples.
LO4	To solve problems using numerical differentiation and integration.
LO5	To solve linear systems, numerical solution of ordinary differential equations.

UNIT	**Details**	**No. of Periods for the Unit**
I	**Algebraic and Transcendental Equations**: Solution of algebraic and transcendental equations- Bisection method – Fixed point iteration method – Newton Raphson method –linear system of equations – Gauss elimination method – Gauss Jordan method. **Chapter 3 Sections – 3.2, 3.3, 3.5** **Chapter 4 Sections – 4.3, 4.4**	**12**
II	**Iterative Methods, Interpolation and Approximation:** Iterative methods - Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices. Interpolation with unequal intervals – Lagrange's - interpolation – Newton's divided difference interpolation. **Chapter 4 Sections – 4.7, 4.8** **Chapter 7 Sections – 7.3 to 7.5**	**12**
III	**Interpolations with equal Interval:** Difference operators and relations. -Interpolation with equal intervals – Newton's forward and backward difference formulae. **Chapter 6 Sections – 6.1, 6.2** **Chapter 7 Sections - 7.0 to 7.2**	**12**
IV	**Numerical Differentiation and Integration:** Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule. **Chapter 8 Sections – 8.0, 8.1, 8.2, 8.5**	**12**
V	**Initial value problems for ordinary differential equations:** Single step methods – Taylor's series method – Euler's method – Modified Euler's method – Runge Kutta method for solving (first, second, third and fourth) order equations. **Chapter 10 Sections - 10.1, 10.3, 10.4**	**12**

Course Outcomes	
Course Outcomes	On completion of this course, students will be able;
CO1	Know how to solve various problems on numerical methods
CO2	To use approximation to solve problems
CO3	To apply differentiation and integration concept.
CO4	To apply , direct methods for solving linear systems
CO5	To use numerical solution of ordinary differential equations

Text Books	
1	Arumugam S., Thangapandi Issac A., Somasundaram A., Numerical Methods, 2nd Edition, Scitech Publications Pvt ltd., Chennai 2017.
References Books	
1	Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI,New Delhi, 2001.
2	Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist –Galgotia Publications (P) Ltd., New Delhi – 1997.
3	M.K. Jain, S.R.K. Iyengar&R.K.Jain – Numerical Methods for Scientific and Engineering Computation – New Age International(P) Ltd., New Delhi – 1996.
4.	Kandasamy P., Thilagavathi K., and Gunavathy K., Numerical Methods, S. Chand and Company Ltd., New Delhi, 12th Edition,2012

Web Resources	
1	Web resources from NDL Library, E-content from open source libraries
2.	http://sites.iiserpune.ac.in/-bhasbapat/phy221_files/curvefitting.pdf
3.	http://www.cs.tau.ac.il/~decor/graphics/adv-slides/solving.pdf
4.	https://www.math.hkust.edu.hk/~machas/numerical-methods.pdf

CO/PSO	**POs**						**PSOs**		
	1	2	3	4	5	6	1	2	3
CO1	S	S	S	M	S	S	S	M	M
CO2	S	S	S	S	S	S	S	M	L
CO3	S	M	S	S	S	M	S	M	M
CO4	S	S	S	S	S	S	S	M	L
CO5	S	S	M	S	S	M	S	M	L

S-Strong M-Medium L-Low