University of Madras

Chepauk, Chennai 600 005

[Est. 1857, State University, NAAC 'A^{++}' Grade, CGPA 3.59, NIRF 2019 Rank: 20]

Website: www.unom.ac.in, Tel. 044-2539 9561

Undergraduate Programme
in
Computer Science with Artificial Intelligence

Syllabus for
B.Sc. Computer Science with Artificial Intelligence
(With effect from the Academic Year 2023 -24)

Learning Outcome Based Curriculum Framework

Note: The Committee is designed Learning Outcome Based Curriculum Framework of Undergraduate Computer Science Programmes prescribed by UGC

I Preamble

Bachelor of Computer Science with Artificial Intelligence is a 3 – Year Undergraduate Programme spread over six semesters. The course is designed to achieve a high degree of technical skills in Problem solving and Modern application development. The course develops requisite professional skills and problem solving along with developing the analytical abilities for pursuing a successful career in software industry and forms the required basics for further higher studies in Computer Science specifically in the area of Artificial Intelligence.

II Eligibility

A pass in the Higher secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu with Mathematics as one of the subjects.

III Programme Objectives

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'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; analyse 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, synthesising and articulating; Ability to recognise cause-andeffect relationships, define problems, formulate hypotheses, test hypotheses, analyse, 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 analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
PO9	Reflective thinking: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.
PO10	Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

IV Programme Specific Objectives

PSO1	To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.
PSO2	To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.
PSO3	To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.
PSO4	Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.
PSO5	Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.

B.Sc. COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

COURSE STRUCTURE

YEAR – I SEMESTER – I

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-I	3	6	25	75	100
Part-II	100L1Z	English Paper-I	3	6	25	75	100
Part-III	126C1A	CC - I: Python Programming **@#$%&**	5	4	25	75	100
	126C11	CC - II: Python Programming Practical **@#$%&**	5	5	40	60	100
	126E1A 126E1B 126E1C	EC - I Generic / Discipline Specific: Mathematics I **@#$%& /** Statistics I **@#$%& /** Physics I **#$%**	3 2	5 3	25 25	75 75	100 100
	---	Physics-I Practical **#$%**	---	2	---	---	---
Part-IV	126S1A	SEC - I: Office Automation **@#$%&** *	2	2	25	75	100
	100S1A	Basic Tamil-I (Other Language Students) *					
	100S1B	Advanced Tamil-I (Other Language Students) *					
	126B1A	FC: Fundamentals of Computers **@#$%&**	2	2	25	75	100
			22/23	30			

*** PART-IV: SEC-1 / Basic Tamil / Advanced Tamil (Any one)**

1. Students who have studied Tamil up to XII STD and also have taken Tamil in Part I shall take SEC-I.
2. Students who have not studied Tamil up to XII STD and have taken any Language other than Tamil in Part-I shall take Basic Tamil comprising of Two Courses (level will be at 6th Std.).
3. Students who have studied Tamil up to XII STD and have taken any Language other than Tamil in Part-I shall take Advanced Tamil comprising of Two Courses.

YEAR – I SEMESTER – II

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-II	3	6	25	75	100
Part-II	100L2Z	English Paper-II	3	6	25	75	100
Part-III	126C2A	CC - III: Java Programming **@#$%&**	5	4	25	75	100
	126C21	CC - IV: Java Programming Practical **@#$%&**	5	5	40	60	100
	126E2A 126E2B 126E2C	EC - II Generic / Discipline Specific Mathematics II **@#$%&**/ Statistics II **@#$%&**/ Physics II **#$%**	3 2	5 3	25 25	75 75	100 100
	126E21	Physics I & II (Practicals) **#$%**	2	2	40	60	100
Part-IV	126S21	SEC-II: Office Automation Practical **@#%&** *	2	2	40	60	100
	100S2A	Basic Tamil-II (Other Language Students) *			25	75	100
	100S2B	Advanced Tamil-II *			25	75	100
	126S2A	SEC - III: Quantitative aptitude **@#$%&**	2	2	25	75	100
			23/24	30			

YEAR – II SEMESTER – III

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-III	3	6	25	75	100
Part-II	200L3Z	English Paper-III	3	6	25	75	100
Part-III	226C3A	CC - V: Data Structures **@%&**	5	4	25	75	100
	226C31	CC - VI: Data Structures Practical **@%&**	5	5	40	60	100
	226E3A 226E3B 226E3C	EC - III Generic / Discipline Specific : Mathematics I **@#$%&**/ Statistics I **@#$%&**/	3	5	25	75	100
		Physics-I **#$%**	2	3	25	75	100
	---	Physics-I Practical **#$%**	---	2	---	---	---
Part-IV	226S31	SEC - IV: Web Page Design Practical **@#$%&**	1	1	40	60	100
	226S32	SEC - V: Desktop publishing Practical **@#$%&**	2	2	40	60	100
	----	Environmental Science	--	1	--	--	--
			21/22	30			

YEAR – II SEMESTER – IV

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part-I	----	Language Paper-IV	3	6	25	75	100
Part-II	200L4Z	English Paper-IV	3	6	25	75	100
Part-III	226C4A	CC - VII: Introduction to Artificial Intelligence **%**	5	4	25	75	100
	226C41	CC -VIII: Prolog Practical **%**	5	4	40	60	100
	226E4A 226E4B 226E4C	EC - IV Generic / Discipline Specific: Mathematics II **@#$%&**/ Statistics II **@#$%&**/	3	5	25	75	100
		Physics-II **#$%**	2	3	25	75	100
	226E41	Physics I & II (Practicals) **#$%**	2	2	40	60	100
Part-IV	226S4A	SEC -VI: Emotional Intelligence **@#$%&**	2	2	25	75	100
	226S4B	SEC -VII: Technical Writing **@#$%&**	2	2	25	75	100
	---	Environmental Science	2	1	25	75	100
			25	30			

YEAR – III SEMESTER – V

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	326C5A	CC - IX: Computer Vision **%**	4	5	25	75	100
	326C51	CC - X: Computer Vision Practical **%**	4	5	40	60	100
	326C5B	CC - XI: Natural Language Processing **%&**	4	5	25	75	100
	326C52	CC - XII: Natural Language Processing Practical **%**	4	5	40	60	100
	326E5A 326E5B 326E5C	EC -V: Computer Networks **#$%&**/ Software Engineering **@#$%&**/ Computing System Fundamentals **#%&**	3	4	25	75	100
	326E5D 326E5E 326E5F	EC -VI: Cloud Computing **@#$%&**/ Big Data Analytics **@#$%&**/ Expert System **%**	3	4	25	75	100
Part-IV	---	Value Education	2	2	25	75	100
	---	Internship / Industrial Training (During summer vacation at the end of IV semester)	2	--	--	--	--
			26	30			

YEAR – III SEMESTER – VI

Part	Sub. Code	List of Courses	Credit	Hrs	Int.	Ext.	Total
Part- III	326C6A	CC - XIII: Machine Learning **%**	4	6	25	75	100
	326C61	CC - XIV: Machine Learning Practical **%**	4	6	40	60	100
	326C6B	Core Paper - XV: Fuzzy Logic **%**	4	6	25	75	100
	326E6A 326E6B 326E6C	EC Course -VII: Mobile Ad-hoc Network **@#$%&**/ Data Mining and Warehousing **@#$%&** / Artificial Neural Networks **%&**	3	5	25	75	100
	326E6D 326E6E 326E6F	EC -VIII: Internet of Things and its Applications **@#$%&**/ Robotics and Its Applications **@#%&** / Information Security **%&**	3	5	25	75	100
Part-IV	326S61	Professional Competency Skill Course: Mini Project **@%&**	2	2	40	60	100
	---	Extension Activity	1	--	--	--	--
			21	30			

@ - Common to B.C.A.
 # - Common to B.Sc. Software Applications
$ - Common to B.Sc. Computer Science
% - Common to B.Sc. Computer Science with Artificial Intelligence
& - Common to B.Sc. Computer Science with Data Science

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UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester:I**

Core-I: Python Programming (Common to B.Sc.-CS, CS with DS, Software Appl. & BCA)	**126C1A**

Credits 5 **Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Describe the core syntax and semantics of Python programming language.
- Discover the need for working with the strings and functions.
- Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
- Understand the usage of packages and Dictionaries

Course Outcomes: (for students: To know what they are going to learn)

CO1: Develop and execute simple Python programs

CO2: Write simple Python programs using conditionals and looping for solving problems

CO3: Decompose a Python program into functions

CO4: Represent compound data using Python lists, tuples, dictionaries etc.

CO5: Read and write data from/to files in Python programs

UNITS	CONTENTS
I	Introduction: The essence of computational problem solving – Limits of computational problem solving-Computer algorithms-Computer Hardware-Computer Software-The process of computational problem solving-Python programming language - Literals - Variables and Identifiers - Operators - Expressions and Data types, Input / output.
II	Control Structures: Boolean Expressions - Selection Control - If Statement-Indentation in Python- Multi-Way Selection -- Iterative Control- While Statement- Infinite loops- Definite vs. Indefinite Loops- Boolean Flag. String, List and Dictionary, Manipulations Building blocks of python programs,Understanding and using ranges.
III	Functions: Program Routines- Defining Functions- More on Functions: Calling Value-Returning Functions- Calling Non-Value-Returning Functions- Parameter Passing - Keyword Arguments in Python - Default Arguments in Python-Variable Scope. Recursion: Recursive Functions.
IV	Objects and their use: Software Objects - Turtle Graphics – Turtle attributes-Modular Design: Modules - Top-Down Design - Python Modules - Text Files: Opening, reading and writing text files – Exception Handling.
V	Dictionaries and Sets: Dictionary type in Python - Set Data type. Object Oriented Programming using Python: Encapsulation - Inheritance – Polymorphism. Python packages: Simple programs using the built-in functions of packages matplotlib, NumPy, pandas etc.

Learning Resources:

Recommended Texts

1. Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem-solving Focus", Wiley India Edition, 2015.
2. Wesley J. Chun, "Core Python Applications Programming", 3rd Edition , Pearson Education, 2016

Reference Books

1. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition.
2. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.
3. John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1590282410
4. Michel Dawson, "Python Programming for Absolute Beginers" , Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-143545500

Web resources

1. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester:I**

Core-II: Python Programming Practical (Common to B.Sc.-CS, CS with DS, Software Appl. & BCA)	**126C11**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Acquire programming skills in core Python.
- Acquire Object-oriented programming skills in Python.
- Develop the skill of designing graphical-user interfaces (GUI) in Python.
- Develop the ability to write database applications in Python.
- Acquire Python programming skills to move into specific branches

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the problem solving approaches

CO2: To learn the basic programming constructs in Python

CO3: To practice various computing strategies for Python-based solutions to real world problems

CO4: To use Python data structures - lists, tuples, dictionaries.

CO5: To do input/output with files in Python.

List of Programs

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Write a Python program to construct the following pattern, using a nested loop

```
*
**
***
****
*****
****
***
**
*
```

3. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria:
   Grade A: Percentage >=80 Grade B: Percentage >=70 and 80
   Grade C: Percentage >=60 and <70 Grade D: Percentage >=40 and <60
   Grade E: Percentage < 40
4. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
5. Write a Python script that prints prime numbers less than 20.

6. Program to find factorial of the given number using recursive function.
7. Write a Python program to count the number of even and odd numbers from array of N numbers.
8. Write a Python class to reverse a string word by word.
9. Given a tuple and a list as input, write a program to count the occurrences of all items of the list in the tuple. (Input: tuple = ('a', 'a', 'c', 'b', 'd'), list = ['a', 'b'], Output: 3)
10. Create a Savings Account class that behaves just like a Bank Account, but also has an interest rate and a method that increases the balance by the appropriate amount of interest (Hint: use Inheritance).
11. Read a file content and copy only the contents at odd lines into a new file.
12. Create a Turtle graphics window with specific size.
13. Write a Python program for Towers of Hanoi using recursion
14. Create a menu driven Python program with a dictionary for words and their meanings.
15. Devise a Python program to implement the Hangman Game.

Learning Resources:

Recommended Texts

1. Charles Dierbach, “Introduction to Computer Science using Python - A computational Problem-solving Focus”, Wiley India Edition, 2015.
2. Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition , Pearson Education, 2016

Reference Books

1. Mark Lutz, “Learning Python Powerful Object Oriented Programming”, O’reilly Media 2018, 5th Edition.
2. Timothy A. Budd, “Exploring Python”, Tata MCGraw Hill Education Private Limited 2011, 1 st Edition.
3. John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications, 2013, ISBN 978- 1590282410
4. Michel Dawson, “Python Programming for Absolute Beginers”, Third Edition, Course Technology Cengage Learning Publications, 2013, ISBN 978-1435455009

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester: II**

Java Programming Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**126C2A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

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

Course Outcomes: (for students: To know what they are going to learn)

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.

Units	**Contents**
I	Introduction: Review of Object-Oriented concepts - Java buzzwords (Platform independence, Portability, Threads)- JVM architecture –Java Program structure - – Java main method - Java Console output(System.out) - simple java program - Data types - Variables - type conversion and casting- Java Console input: Buffered input - operators - control statements - Static Data - Static Method - String and String Buffer Classes
II	Java user defined Classes and Objects – Arrays – constructors - 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
III	Exception Handling: try – catch - throw - throws –- finally – Built-in exceptions - Creating own Exception classes - garbage collection, finalise -Multithreaded Programming: Thread Class - Runnable interface – Synchronization – Using synchronized methods – Using synchronized statement - Interthread Communication – Deadlock.
IV	The AWT class hierarchy - Swing: Introduction to Swing - Hierarchy of swing components. Containers - Top level containers - JFrame - JWindow - JDialog - JPanel - JButton - JToggleButton - JCheckBox - JRadioButton - JLabel,JTextField - JTextArea - JList - JComboBox – JscrollPane - Event Handling: Events - Event sources - Event Listeners - Event Delegation Model (EDM) - Handling Mouse and Keyboard Events
V	Adapter classes - Inner classes -Java Util Package / Collections Framework:Collection & Iterator Interface- Enumeration- List and ArrayList- Vector- Comparator

Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O'Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester: II**

Java Programming Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**126C21**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

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

Course Outcomes: (for students: To know what they are going to learn)

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 StringBuffer classes
CO4: Demonstrate Event Handling.
CO5: Create applications using Swing and AWT

List of Programs

1. Write a Java program that prompts the user for an integer and 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 of characters, 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 StringBuffer 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 generates random 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 the value 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 the use 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 the user, 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. Include bold italic options. Use frames and controls.

13. Write a Java program that handles all mouse events and shows the event name at the center of the window when a 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 for the +, -,*, % 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.

Learning Resources:

Recommended Texts

Herbert Schildt, The Complete Reference, Tata McGraw Hill, New Delhi, 7th Edition, 2010.

Gary Cornell, Core Java 2 Volume I – Fundamentals, Addison Wesley, 1999.

Reference Books

Head First Java, O’Rielly Publications, Y. Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.

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

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: III**

Data Structures Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**226C3A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart the basic concepts of data structures and algorithms.
- To acquaint the student with the basics of the various data structures
- This course also gives insight into the various algorithm design techniques

Course Outcomes: (for students: To know what they are going to learn)

CO1: To introduce the concepts of Data structures and to understand simple linear data structures.

CO2: Learn the basics of stack data structure, its implementation and application

CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.

CO4: To introduce the basic concepts of algorithms

CO5: To give clear idea on algorithmic design paradigms like Divide and conquer and Backtracking,

Units	**Contents**
I	**INTRODUCTION TO DATA STRUCTURES:** Representation of arrays, Applications of arrays, sparse matrix and its representation - Linear list: Singly linked list implementation, insertion, deletion and searching operations on linear list
II	Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations. **STACKS and QUEUES:** Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation
III	Queues: operations on queues, array and linked representations - Circular Queue: operations, applications of queues. **TREES & GRAPHS:** **Trees:** Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder, preorder), Binary search trees in arrays
IV	Heaps - AVL Trees – B Trees **Graphs:** Representation of Graphs- Types of graphs
V	**Graph Applications:** Breadth first traversal – Depth first traversal- -Single source shortest path – Minimal spanning trees – prim's and kruskal's algorithms

Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, "The design and analysis of ComputerAlgorithms", Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. Sanjoy Dasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: III**

Data Structures Practical Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**226C31**
Credits 5	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand and implement basic data structures using C++
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement data structures using C++
CO2: Implement various types of linked lists and their applications
CO3: Implement Tree Traversals
CO4: Implement various algorithms in C++

List of Programs

Implement the following exercises using Java Programming language:

1. Array implementation of stacks
2. Array implementation of Queues
3. Linked list implementation of stacks
4. Linked list implementation of Queues
5. Covert infix expression to postfix.
6. Binary Tree Traversals (Inorder, Preorder, Postorder)
7. Implementation of Linear search and binary search
8. Implementation of Depth-First Search & Breadth-First Search of Graphs.
9. Finding single source shortest path of a Graph.

Learning Resources:

Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , "Fundamentals of Data in C", Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,"Fundamentals of Computer Algorithms " Universities Press

Reference Books

1. Seymour Lipschutz ,"Data Structures with C", First Edition, Schaum's outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, "Fundamentals of Algorithms", PHI, New Delhi, 1997.

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Introduction to Artificial Intelligence	**226C4A**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Gain a historical perspective of AI and its foundations.
- Become familiar with basic principles of AI toward problem solving, inference, perception,Knowledge representation, and learning.
- Experience AI development tools such as an Prolog
- Explore the current scope, potential, limitations, and implications of intelligent systems.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.

CO3: Demonstrate awareness and a fundamental understanding of various applications of AI techniques

CO4: Demonstrate proficiency developing applications in Prolog.

CO5: Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications

Units	**Contents**
I	Introduction, growth and Applications of AI What Is Artificial Intelligence?: Brain Science and Problem Solving, The Turing Test and Chatterbots-TheHistory of AI: The First Beginnings,Logic Solves (Almost) All Problems, The NewConnectionism,Reasoning Under Uncertainty,Distributed; Autonomous and Learning Agents,AI GrowsUp-The AI Revolution: AI and Society, Does AI Destroy Jobs? - Agents Knowledge - Based Systems
II	Propositional logic: Reasoning in Daily Life-Inference Patterns, Validity, and Invalidity-Classification, Consequence, andUpdate-The Language of Propositional Logic: From natural language to logical notation, Inclusive andexclusive disjunction, implications, Double implications, Ambiguity - Semantic Situations, Truth Tables,Binary Arithmetic, Tautology, Contradiction, conjunctive normal form, equivalence of propositions
III	First-Order Predicate Logic Inference rules: Modus Ponens, Modus Tollens, Hypothetical Syllogism, Disjunctive Syllogism, Addition,Simplification, Resolution - Quantifiers in First-order logic-Properties of Quantifiers-Free and BoundVariables-Inference in First-Order Logic:FOL inference rules for quantifier: Universal Generalization,Universal Instantiation, Existential Instantiation, Existential introduction - Unification: Conditions forUnification, Unification Algorithm- Resolution: Steps for Resolution-Forward Chaining and backwardchaining
IV	Prolog: Why prolog for AI- Rules- Syntax- Constants- variables- characters-operators- Equality & unification -Arithmetics - Satisfying goals

V	Data structures in Prolog: Trees- lists- Recursive search- Mapping- Recursive Comparison- Joining Structures - Accumulators (VS)Difference structures- Backtrack: Multiple solutions- The 'Cut':- Uses of Cut- problems with Cut

Learning Resources:

TEXT BOOK:

1. Introduction to Artificial Intelligence, Wolfgang Erte, Springer, Cham
2. Programming in Prolog,W.F. Clocksin, C.S. Mellish.-5th ed,Springer

REFERENCES:

1. Artificial Intelligence For Dummies,John Paul Mueller,Luca Massaron;Dummies
2. Artificial Intelligence: A Modern Approach.Stuart Russell,Peter Norvig;Prentice Hall
3. PROLOG: Programming for Artificial Intelligence, BRATKO,Pearson
4. Prolog by Example: by Helder Coelho , Jose C. Cotta ,Springer

WEB REFERENCES:

1. https://logicinaction.org/docs/ch2.pdf

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Prolog Practical	**226C41**
Credits 5	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Understand Formal logic and associated forms of programming
- Understand Reasoning modelling
- Interpret the logical consequences and validity of formulae using the rules of propositional and predicate logic
- Assess the completeness of Resolution Procedure, Soundness and completeness of Linear Resolution, Unification and Selective Linear Definite Resolution.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Demonstrate Logic Programming Paradigm, Prolog execution models, Prolog's basic and advancedprolog concepts such as LIST, CUT, and Fail using illustrative programming examples.

CO2: Convert world knowledge into FOPL formula and construct well-crafted prolog programmes ofmoderate size

CO3: Apply truth functional propositional Logic(PL) and first order predicate logic (FOPL) to worldknowledge

CO4: Describe the basic predicates to manipulate list data structure and sorting algorithms using PROLOGprogramming

Contents

1. Check if the predicate functor(Term, F, A) succeeds if Term has functor F and arity A by defining afunctor
2. Find the number of elements of a list (with size >1) and remove the middle element (at positionsize//2)
3. Create a list containing all integers within a given range and Reverse the list
4. Write a function append to concatenate elements of two lists into a third list
5. Write a predicate table/3 which prints the truth table of a given logical expressionin two variables.
6. Write a Prolog program using (;) operator to decide whether or not any number was between twoother numbers (i.e., to check if number N is between two numbers N1 and N2 if either N is greaterthan N1 and N is less than N2 or N is less than N1 or N is greater than N2.)
7. Write a Prolog function to find the factorial of a number
8. Query if an element is a member of a list, (using member predicate). To the in-built select functionpass a member of the list and return the remainder of the list
9. Demonstrate the use of built-in predicate function findall in a program
10. Evaluate mathematical expressions involving power(**), integer division(//), mod, sqrt and the otherbasic math operations(+,-,*,%)
11. Use conditions to check the greatest of given two numbers in the stdin/input (not using the maxoperator)
12. Check the negation of the goal using \+ operator
13. Define a new infix operator is_bigger to compare the size of two animals mentioned in the facts

14. Check whether a given term represents a binary tree
15. Construct a completely balanced binary tree in Prolog

Learning Resources:
https://sites.google.com/site/prologsite/prolog-problems/
https://ocw.upj.ac.id/files/Textbook-TIF212-Prolog-Tutorial-3.pdf
http://www.cse.unsw.edu.au/~billw/dictionaries/prolog/
https://www.dai.ed.ac.uk/groups/ssp/bookpages/quickprolog/
https://www.educba.com/prolog-programming/

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Computer Vision	**326C5A**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce students the fundamentals of image formation;
- To introduce students the major ideas,methods, and techniques of computer vision and pattern recognition;
- To develop an appreciation for various issues in the design of computer vision and object recognition systems; and
- To provide the student with programming experience from implementing computer vision and object recognition applications.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Identify basic concepts, terminology, theories, models and methods in the field of computer vision

CO2: Describe known principles of human visual system

CO3: Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition

CO4: Suggest a design of a computer vision system for a specific problem

Units	Contents
I	**Introduction:** Image Processing, Computer Vision and Computer Graphics, what is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality
II	**Digital Image Formation and low-level processing:** Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.
III	**Feature Extraction & Image Segmentation:** Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Gabor Filters and DWT; Image Segmentation: Contour based representation, Region based representation, Level set representations, Fourier and wavelet descriptors, Multi resolution analysis
IV	**Pattern & Motion Analysis:**Clustering: K-Means, K-Medoids, Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, Dimensionality Reduction: LDA, ICA, Background Subtraction and Modeling, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.
V	**Applications:** Photo album – Face detection – Face recognition – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – tracking and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians

Learning Resources:

TEXT BOOK:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.

REFERENCE BOOK:

1. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.
2. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
3. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006
4. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
5. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
6. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

WEB REFERENCES:

1. https://viso.ai/blog/
2. https://learnopencv.com/
3. https://www.analyticsvidhya.com/blog/
4. https://www.rsipvision.com/rsip-vision-learns/

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Computer Vision Practical	**326C51**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- Understand What Is A Digital Image and what is Manipulating Images
- Understand Manipulating Images One Pixel At a Time, Pixel Transformations, geometric Operations

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement Spatial Operations in Image Processing

CO2: Implement the Image Gradients and Edge Detection Techniques

CO3: Implement Extraction of desired features

CO4: Implement object detection

Contents

1. Perform the image transformations that include the geometric and morphological transformations.
2. Perform the image enhancement by applying contrast limited adaptive histogram Equalization
3. Perform the Contours and Region based segmentation in images
4. Perform the Wavelet Transforms on image using PyWavelets.
5. Perform the K-Means clustering for Image segmentation using CV2 library.
6. Perform basic motion detection and tracking using python and OpenCV
7. Perform face detection using OpenCV library
8. Perform Foreground Extraction in an image
9. Perform Pedestrian Detection using OpenCV and Python.

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Natural Language Processing Practical	**326C52**
Credits 4	**Lecture Hours:5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To familiarize various NLP software libraries and datasets publicly available.
- To develop systems for various NLP problems with moderate complexity.
- To learn various strategies for NLP system evaluation and error analysis.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Describe the concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.

CO2: Demonstrate understanding of the relationship between NLP and statistics & machine learning.

CO3: Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.

CO4: Develop systems for various NLP problems with moderate complexity

Contents

1. How to tokenize a given text?
2. How to get the sentences of a text document ?
3. How to tokenize text with stop words as delimiters?
4. How to remove stop words and punctuations in a text ?
5. How to perform stemming?
6. How to lemmatize a given text ?
7. How to extract usernames from emails ?
8. How to find the most common words in the text excluding stopwords?
9. How to do spell correction in a given text ?
10. How to classify a text as positive/negative sentiment?
11. How to extract Noun and Verb phrases from a text ?
12. How to find the ROOT word of any word in a sentence?
13. Write a Python program to load the iris data from a given csv file into a Data frame and print the shape of the data, type of the data and first 3 rows.
14. Write a Python NLTK program to find the sets of synonyms and antonyms of a given word.
15. Write a Python NLTK program to print the first 15 random combine labelled male and labelled female names from names corpus.

Learning Resources:

TEXT BOOKS:

1. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,3rdEdition, 2018.

REFERENCE BOOKS:

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav "A Primer on Neural Network Models for Natural LanguageProcessing".
3. Natural Language Processing with Python, Steven Bird, Ewan Klein, and EdwardLoper

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Machine Learning	**326C6A**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand basic concepts of machine learning
- Understand how to evaluate models generated from data
- Discover how to build machine learning algorithms, prepare data, and use different techniques using Python

Course Outcomes: (for students: To know what they are going to learn)

CO1: Implement different machine learning algorithm techniques.

CO2: Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

CO3: Apply appropriate data sets to the Machine Learning algorithms.

CO4: Identify and apply Machine Learning algorithms to solve real world problems.

Units	Contents
I	**Introduction:** Machine Learning Foundations – Overview – Design of a Learning System – Types of Machine Learning – Supervised Learning and Unsupervised Learning – Applications of Machine Learning – Tools Overview for ML.
II	**Supervised Learning – I:** Simple Linear Regression – Multiple Linear Regression – Polynomial Regression – Ridge Regression – Lasso Regression – Evaluating Regression Models – Model Selection – Bagging – Ensemble Methods.
III	**Supervised Learning – II:** Classification – Logistic Regression – Decision Tree Regression and Classification – Random Forest Regression and Classification – Support Vector Machine Regression and Classification - Evaluating Classification Models.
IV	**Unsupervised Learning:** Clustering – K-Means Clustering – Density-Based Clustering – Dimensionality Reduction – Collaborative Filtering.
V	**Association Rule Learning :** Association Rule Learning – Concepts related to ARL – ARL Algorithms - Apriori – Eclat – Concepts and Algorithms.

Learning Resources:

TEXT BOOK:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.

REFERENCE BOOK:

1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3. Sebastian Raschka, Vahid Mirjilili,” Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018
4. Carol Quadros,” Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018
5. Gavin Hackeling,” Machine Learning with scikit-learn”, Packet publishing, O'Reilly, 2018

WEB REFERENCES:

1. Stanford Lectures of Prof. Andrew Ng on Machine Learning

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Fuzzy Logic	**326C6B**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To familiarize various components of soft computing like fuzzy logic
- To give an overview of fuzzy Logic and to understand the concepts and terminologies offuzzy systems

Course Outcomes: (for students: To know what they are going to learn)

CO1: Identify and describe soft computing techniques and their roles in building intelligent Machines.

CO2: Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems

CO3: Recognize the feasibility of applying a soft computing methodology for a particular Problem.

Units	Contents
I	**Introduction, Classical Sets and Fuzzy Sets:** Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information, Fuzzy Sets and Membership, Chance versus Ambiguity. Classical Sets - Operations on Classical Sets, Properties of Classical (Crisp) Sets, Mapping of Classical Sets to Functions Fuzzy Sets - Fuzzy Set operations, Properties of Fuzzy Sets. Sets as Points in Hypercubes
II	**Classical Relations and Fuzzy Relations:** Cartesian Product, Crisp Relations-Cardinality of Crisp Relations, Operations on Crisp Relations, Properties of Crisp Relations, Composition. Fuzzy Relations - Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, Non-interactive Fuzzy Sets. Tolerance and Equivalence Relations - Crisp Equivalence Relation, Crisp Tolerance Relation, Fuzzy Tolerance and Equivalence Relations. Value Assignments - Cosine Amplitude, Max-min Method, Other Similarity methods
III	**Fuzzy-to-Crisp Conversions, Fuzzy Arithmetic:** Lambda-Cuts for Fuzzy Sets, Lambda-Cuts for Fuzzy Relations, Defuzzification Methods Extension Principle - Crisp Functions, Mapping and Relations, Functions of fuzzy Sets – Extension Principle, Fuzzy Transform (Mapping), Practical Considerations, Fuzzy Numbers Interval Analysis in Arithmetic, Approximate Methods of Extension - Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons, Fuzzy Vectors
IV	**Classical Logic and Fuzzy Logic:** Classical Predicate Logic – Tautologies, Contradictions, Equivalence, Exclusive OR and Exclusive NOR, Logical Proofs, Deductive Inferences. Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence and Logical Proofs, Other forms of the Implication Operation, Other forms of the Composition Operation

V	**Fuzzy Rule- Based Systems:**Natural Language, Linguistic Hedges, Rule-Based Systems - Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules, Graphical Techniques of Inference

Learning Resources:

Text Book:

1. Lin C. T. and C.S. G. Lee, Neural Fuzzy Systems, Prentice Hall, 1996

References:

1. Ibrahim A. M., Introduction to Applied Fuzzy Electronics, PHI, 2013
2. J. Yen and R. Langari, Fuzzy Logic, Intelligence, Control and Information, Pearson Education
3. K.H.Lee, First Course on Fuzzy Theory and Applications, Springer-Verlag

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Machine Learning Practical	**326C61**
Credits 4	**Lecture Hours:6 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)
Understand the mathematical and statistical perspectives of machine learning algorithms through python programming.
Understand the basic concepts of deep neural network models and design the same.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Design and evaluate the unsupervised models through python in built functions.

CO2: Evaluate the machine learning model algorithms by python programming.

CO3: Design and apply various reinforcement algorithms to solve real time complex problems.

CO4: Design and develop the code for the recommender system using Natural Language processing.

Contents

1. Write a program to implement the Simple and Multiple Linear Regression
2. Write a program to implement the Polynomial Regression
3. Write a program to implement the Bagging Technique
4. Write a program to implement the Adaboost Methods
5. Write a program to implement Logistic Regression algorithm
6. Write a program to demonstrate the workflow of Decision Tree Classification
7. Write a program to implement the Random Forest Classification
8. Write a program to implement the SVM Classification
9. Write a program to perform the K Means Clustering
10. Write a program to perform the Density based Clustering
11. Write a program to implement the Apriori algorithm for market basket analysis
12. Write a program to compare the Supervised Machine Learning algorithms.

Learning Resources:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
2. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
3. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
4. Sebastian Raschka, Vahid Mirjilili,” Python Machine Learning and deep learning”, 2nd edition, kindle book, 2018
5. Carol Quadros,” Machine Learning with python, scikit-learn and Tensorflow”, Packet Publishing, 2018
6. Gavin Hackeling,” Machine Learning with scikit-learn”, Packet publishing, O'Reilly, 2018
7. Stanford Lectures of Prof. Andrew Ng on Machine Learning

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester: I**

<table>
<tr><td>Title of the Course</td><td colspan="6">MATHEMATICS – I
(Common to B.Sc Physics, Physics with CA, Chemistry, Computer Science, ECS, Data Science, Software Applications & BCA)</td></tr>
<tr><td>Paper Number</td><td colspan="6">ELECTIVE COURSE I</td></tr>
<tr><td rowspan="2">Category Elective</td><td>Year</td><td>I</td><td>Credits</td><td>3</td><td>Course Code</td><td>126E1A</td></tr>
<tr><td>Semester</td><td>I</td><td colspan="3"></td></tr>
<tr><td>Instructional Hours per week</td><td colspan="2">Lecture
4</td><td colspan="2">Tutorial
1</td><td>Lab Practice
--</td><td>Total
5</td></tr>
<tr><td>Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td>Objectives of the Course</td><td colspan="6">• Students gain knowledge about the basic concepts of Algebra, Theory of Equations.
• They also gain the basic knowledge in Matrices, Trigonometry and Differential Calculus.</td></tr>
<tr><td rowspan="4">Course Outline</td><td colspan="6">UNIT-I: Summation of series: Binomial series -Exponential series - Logarithmic series -Simple Problems. Hours: 15

Chapter 2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.</td></tr>
<tr><td colspan="6">UNIT II: Matrices: Symmetric– Skew-Symmetric–Hermitian– Skew-Hermitian –Orthogonal and Unitary matrices– Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem.

Chapter 4: Sections: 4.1.1 –4.1.6, 4.5.2 and 4.5.3. Hours: 15</td></tr>
<tr><td colspan="6">Unit III: Numerical Methods: Newton's method to find a root approximately. Finite Differences: Interpolation: Operators, Δ, ∇, E, E^{-1} difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula. Hours:15
Chapter 3: Sections 3.4.1. Chapter 5: Sections: 5.1 and 5.2.</td></tr>
<tr><td colspan="6">Unit IV: Trigonometry: Expansions of $\sin^n\theta$, $\cos^n\theta$ in a series of powers of sinθ and cosθ - Expansions of sin(nθ) and cos(nθ) in a series sines and cosines of multiples of "θ" - Expansions of sinθ, cosθ and tanθ in a series of powers of "θ" – Hyperbolic and inverse hyperbolic functions .
Chapter 6: Section 6.1 – 6.3 Hours:15</td></tr>
<tr><td colspan="6">Unit V: Differential Calculus: Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems
Chapter 1, Section 1.1 to 1.3.1. Hours: 15
Total Hours:75</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Allied Mathematics, Volume I and Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications **Volume I: Unit I – IV, Volume II – Unit V**
Reference Books	1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal
Website and e-Learning Source	1. http://www.themathpaage.com 2. http://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the concepts of Summation of Series.

CLO 2: Understand the concepts of Cayley Hamilton Theorem and inverse matrices.

CLO 3: Understand the concepts of finite differences.

CLO 4: Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions.

CLO 5: Understand the concept of Leibnitz theorem and functions of two variables

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	2	3	1	3	1	1	3	1	1
CLO 2	3	2	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	3	3	1	3	1	1	3	1	1
CLO 5	3	2	1	3	1	1	3	1	1

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN SOFTWARE APPLICATIONS

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICS – II
(Common to B.Sc-Physics, Physics with CA, Chemistry, Computer Science, ECS, Data Science, Artificial Intelligence, Software Applications & BCA)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE II</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>I</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">141E2A</td></tr>
<tr><td>Semester</td><td>II</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td colspan="2">1</td><td>--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Students gain some knowledge in Integral Calculus, Differential Equations.
• They also learn the basic concepts in Laplace Transforms and Vector Calculus</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">Unit I: Integral calculus: Bernouli's Formula, Reduction Formula
$Sin^n\theta$, $Cos^n\theta$, $Sin^m\theta\ Cos^n\theta$ – Simple Problems. Hours: 15</td></tr>
<tr><td colspan="6">Unit II : Fourier Series: Fourier series for functions $(0, 2\pi), (-\pi, \pi)$
Chapter 4: Section : 4.1, 4.1.1 Hours: 15</td></tr>
<tr><td colspan="6">Unit III: Differential Equations: Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form ay" +by'+ cy = X where X is of the form cos and sin - Related problems only.
Partial Differential Equations: Formation, complete integrals and general integrals, fourstandard types and solving Lagrange's linear equation P p +Q q= R.
Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4 Hours: 15</td></tr>
<tr><td colspan="6">Unit IV: Laplace Transforms: Laplace transformations of standard functions and simple properties, inverseLaplace transforms.
Chapter 7: Section 7.1.1 to 7.1.4 & 7.2 to 7.2.3 Hours: 15</td></tr>
<tr><td colspan="6">Unit V: Vector Differentiation: Introduction, Scalar point functions, Vector point functions, vector differential operator Gradient, Divergence, Curl, Solenoidal, irrotational, identities.
Chapter 8, Section 8.1 to 8.4.4 Hours: 15</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	**Total Hours: 75** Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Allied Mathematics, Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications
Reference Books	1. Ancillary Mathematics by S. Narayanan and T.K. ManickavachagomPillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal
Website and e-Learning Source	1. http://www.themathpaage.com 2. http://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the various concepts of Bernoulli's and Reduction Formula.

CLO 2: Understand the concepts of Fourier Series

CLO 3: Understand the concepts of Non-Homogenous and Partial Differential Equations

CLO 4: Understand the Laplace Transforms

CLO 5: Understand the concepts of Vector Differentiation.

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	1	3	2	3	1	1	3	1	1
CLO 2	2	3	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	2	3	1	3	1	1	3	1	1
CLO 5	3	3	2	3	1	1	3	1	1

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICS – I
(Common to B.Sc-Physics, Physics with CA, Chemistry, Computer Science, ECS, Data Science, Artificial Intelligence, Software Applications & BCA)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE III</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">226E3A</td></tr>
<tr><td>Semester</td><td>III</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td>Tutorial</td><td colspan="2">Lab Practice</td><td>Total</td></tr>
<tr><td colspan="2">4</td><td>1</td><td colspan="2">--</td><td>5</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Necessary skills to analyze and make decision on Assignment and Transportation problems Simple Harmonic Motion
• To solve real world problems on Sequencing and Network and its applications</td></tr>
<tr><td colspan="2" rowspan="4">Course Outline</td><td colspan="6">UNIT-I: Summation of series: Binomial series -Exponential series - Logarithmic series -Simple Problems. Hours: 15

Chapter 2: Sections: 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3.</td></tr>
<tr><td colspan="6">UNIT II: Matrices: Symmetric– Skew-Symmetric–Hermitian– Skew-Hermitian –Orthogonal and Unitary matrices– Cayley-Hamilton theorem (without proof) – Verification- Computation of inverse of matrix using Cayley - Hamilton theorem.

Chapter 4: Sections: 4.1.1 –4.1.6, 4.5.2 and 4.5.3. Hours: 15</td></tr>
<tr><td colspan="6">Unit III: Numerical Methods: Newton's method to find a root approximately. Finite Differences: Interpolation: Operators, Δ, ∇, E, E^{-1} difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula. Hours:15
Chapter 3: Sections 3.4.1. Chapter 5: Sections: 5.1 and 5.2.</td></tr>
<tr><td colspan="6">Unit IV: Trigonometry: Expansions of $\sin^n\theta$, $\cos^n\theta$ in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of "θ" - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of "θ" – Hyperbolic and inverse hyperbolic functions .
Chapter 6: Section 6.1 – 6.3 Hours:15</td></tr>
<tr><td colspan="6">Unit V: Differential Calculus: Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems

Chapter 1, Section 1.1 to 1.3.1. Hours: 15</td></tr>
<tr><td colspan="6">Total Hours:75</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	Allied Mathematics, Volume I and Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications **Volume I: Unit I – IV, Volume II – Unit V**
Reference Books	1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal
Website and e-Learning Source	1. http://www.themathpaage.com 2. http://nptel.ac.in

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the concepts of Summation of Series.

CLO 2: Understand the concepts of Cayley Hamilton Theorem and inverse matrices.

CLO 3: Understand the concepts of finite differences.

CLO 4: Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions.

CLO 5: Understand the concept of Leibnitz theorem and functions of two variables

	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO 1	2	3	1	3	1	1	3	1	1
CLO 2	3	2	1	3	1	1	3	1	1
CLO 3	3	2	1	3	1	1	3	1	1
CLO 4	3	3	1	3	1	1	3	1	1
CLO 5	3	2	1	3	1	1	3	1	1

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UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="6">MATHEMATICS – II
(Common to B.Sc-Physics, Physics with CA, Chemistry, Computer Science, ECS, Data Science, Artificial Intelligence, Software Applications & BCA)</td></tr>
<tr><td colspan="2">Paper Number</td><td colspan="6">ELECTIVE COURSE IV</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Elective</td><td>Year</td><td>II</td><td rowspan="2">Credits</td><td rowspan="2">3</td><td rowspan="2">Course Code</td><td rowspan="2">226E4A</td></tr>
<tr><td>Semester</td><td>IV</td></tr>
<tr><td colspan="2" rowspan="2">Instructional Hours per week</td><td colspan="2">Lecture</td><td colspan="2">Tutorial</td><td>Lab Practice</td><td>Total</td></tr>
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<tr><td colspan="2">Pre-requisite</td><td colspan="6">12th Standard Mathematics</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="6">• Necessary skills to analyze and make decision on Assignment and Transportation problems Simple Harmonic Motion
• To solve real world problems on Sequencing and Network and its applications</td></tr>
<tr><td colspan="2" rowspan="5"></td><td colspan="6">Unit I: Integral calculus: Bernouli's Formula, Reduction Formula
$Sin^n\theta$, $Cos^n\theta$, $Sin^m\theta\ Cos^n\theta$ – Simple Problems. Hours: 15</td></tr>
<tr><td colspan="6">Unit II : Fourier Series: Fourier series for functions $(0, 2\pi), (-\pi, \pi)$
Chapter 4: Section : 4.1, 4.1.1 Hours: 15</td></tr>
<tr><td colspan="6">Unit III: Differential Equations: Ordinary Differential Equations: second order non- homogeneous differential equations with constant coefficients of the form ay" +by'+ cy = X where X is of the form cos and sin - Related problems only.
Partial Differential Equations: Formation, complete integrals and general integrals, fourstandard types and solving Lagrange's linear equation P p +Q q= R.
Chapter 5: Section 5.2.1, Chapter 6: Section 6.1 to 6.4 Hours: 15</td></tr>
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Chapter 7: Section 7.1.1 to 7.1.4 & 7.2 to 7.2.3 Hours: 15</td></tr>
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Chapter 8, Section 8.1 to 8.4.4 Hours: 15</td></tr>
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Recommended Text	Allied Mathematics, Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications
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Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the various concepts of Bernoulli's and Reduction Formula.

CLO 2: Understand the concepts of Fourier Series

CLO 3: Understand the concepts of Non-Homogenous and Partial Differential Equations

CLO 4: Understand the Laplace Transforms

CLO 5: Understand the concepts of Vector Differentiation.

	Pos						PSOs		
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CLO 5	3	3	2	3	1	1	3	1	1

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Computer Networks Common for B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5A**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the concept of Data communication and Computer network
- To get a knowledge on routing algorithms.
- To impart knowledge about networking and inter networking devices
- To gain the knowledge on Security over Network communication

Course Outcomes: (for students: To know what they are going to learn)

CO1: To Understand the basics of Computer Network architecture, OSI and TCP/IP reference models

CO2: To gain knowledge on Telephone systems and Satellite communications

CO3: To impart the concept of Elementary data link protocols

CO4: To analyse the characteristics of Routing and Congestion control algorithms

CO5: To understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

Units	**Contents**
I	Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP Models – Example Networks: Internet, ATM, Ethernet and Wireless LANs - Physical Layer – Theoretical Basis for Data Communication - Guided Transmission Media
II	Wireless Transmission - Communication Satellites – Telephone System: Structure, Local Loop, Trunks and Multiplexing and Switching. Data Link Layer: Design Issues – Error Detection and Correction.
III	Elementary Data Link Protocols - Sliding Window Protocols – Data Link Layer in the Internet - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols – Bluetooth
IV	Network Layer - Design Issues - Routing Algorithms - Congestion Control Algorithms – IP Protocol – IP Addresses – Internet Control Protocols.
V	Transport Layer - Services - Connection Management - Addressing, Establishing and Releasing a Connection – Simple Transport Protocol – Internet Transport Protocols (ITP) - Network Security: Cryptography.

Learning Resources:

Recommended Texts

1. S. Tanenbaum, “Computer Networks”, 4th Edition, Prentice-Hall of India, 2008.

Reference Books

1. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, 4th Edition, 2015.
2. F. Halsall, “Data Communications, Computer Networks and Open Systems”, Pearson Education, 2008.
3. D. Bertsekas and R. Gallagher, “Data Networks”, 2nd Edition, PHI, 2008.
4. Lamarca, “Communication Networks”, Tata McGraw- Hill, 2002

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Software Engineering Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5B**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To introduce the software development life cycles
- To introduce concepts related to structured and objected oriented analysis & design co
- To provide an insight into UML and software testing techniques

Course Outcomes: (for students: To know what they are going to learn)

1. The students should be able to specify software requirements, design the software using tools
2. To write test cases using different testing techniques.

Units	Contents
I	Introduction – Evolution – Software Development projects – Emergence of Software Engineering.Software Life cycle models – Waterfall model – Rapid Application Development – Agile Model – SpiralModel
II	Requirement Analysis and Specification – Gathering and Analysis – SRS – Formal System Specification
III	Software Design – Overview – Characteristics – Cohesion & Coupling – Layered design – Approaches Function Oriented Design – Structured Analysis – DFD – Structured Design – Detailed design
IV	Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Interaction, Activity, State Chart – Postscript
V	Coding & Testing – coding – Review – Documentation – Testing – Black-box, White-box, Integration, OO Testing, Smoke testing.

TEXT BOOK:

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI 2018, 5th Edition.

REFERENCE BOOKS:

1. Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, McGraw Hill 2010, 7thEdition.

2. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House 2011,3rd Edition.

WEB REFERENCES:

NPTEL online course – Software Engineering - https://nptel.ac.in/courses/106105182/

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Computing System Fundamentals Common for B.Sc.-SA , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	326E5C
Credits 3	**Lecture Hours: 4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To understand the fundamental concepts and role of Operating System.
- To learn the Process Management and Scheduling Algorithms
- To understand the Memory Management policies
- To gain insight on I/O and File management techniques

Course Outcomes: (for students: To know what they are going to learn)

1. Understand the structure and functions of Operating System
2. Compare the performance of Scheduling Algorithms
3. Analyse resource management techniques

Units	**Contents**
I	Introduction to System Views and Types - Basics of OS Structure, Operations, and Services - Process Management: Processes, Scheduling, Inter-process Communication
II	CPU Scheduling: Schedulers, Criteria, Algorithms - Process Synchronization: Critical-Section Problem, Semaphores
III	Classical Problems of Synchronization: Monitors - Deadlock Characterization, Handling Methods: Prevention, Avoidance, Detection, Recovery
IV	Memory Management: Hardware, Address Binding, Space Allocation - Virtual Memory: Demand Paging, Page Replacement, Thrashing - File System Concepts: Access Methods, Directory Structure, Protection
V	Overview of I/O Hardware, Application Interface - Kernel I/O Subsystem: Handling I/O Requests - System Protection: Goals, Domain, Access Matrix - System Security: Threats, Encryption, User Authentication

TEXT BOOK:

1. Abraham Silberschatz, Peter B Galvin, Greg Gagne, “Operating System Concepts”, Wiley India Pvt. Ltd 2018, 9th Edition,.

REFERENCES:

1. William Stallings, “Operating Systems Internals and Design Principles”, Pearson, 2018, 9th Edition.
2. Andrew S. Tanenbaum, Herbert Bos, “Modern Operating Systems”, Pearson 2014, 4th Edition.

WEB REFERENCES:

NPTEL & MOOC courses titled Operating Systems ¬ https://nptel.ac.in/courses/106106144/

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Cloud Computing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5D**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To impart fundamental concepts of Cloud Computing.
- To impart a working knowledge of the various cloud service types and their uses and pitfalls.
- To enable the students to know the common features and differences in the service offerings of the three major Cloud Computing service providers, namely Amazon, Microsoft and Google.
- To provide know-how of the various aspects of application design, benchmarking and security on the Cloud.

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the concepts and technologies involved in Cloud Computing.
CO2: To understand the concepts of various cloud services and their implementation in the Amazon, Microsoft and Google cloud computing platforms.
CO3: To understand the aspects of application design for the Cloud.
CO4: To understand the concepts involved in benchmarking and security on the Cloud.
CO5: To understand the way in which the cloud is used in various domains.

Units	**Contents**
I	Introduction to Cloud Computing: Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications. Cloud Concepts and Technologies: Virtualization – Load balancing – Scalability and Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service Level Agreements – Billing.
II	Compute Services: Amazon Elastic Computer Cloud - Google Compute Engine - Windows Azure Virtual Machines. Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage Database Services: Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks - Queuing Services - Email Services - Notifiction Services - Media Services Content Delivery Services: Amazon CloudFront - Windows Azure Content Delivery Network Analytics Services: Amazon Elastic MapReduce - Google MapReduce Service - Google BigQuery - Windows Azure HDInsight Deployment and Management Services: Amazon Elastic Beanstack - Amazon CloudFormation

	Identity and Access Management Services: Amazon Identiy and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: CloudStack – Eucalyptus - OpenStack
III	Cloud Application Design: Introduction – Design Consideration for Cloud Applications – Scalability – Reliability and Availability – Security – Maintenance and Upgradation – Performance – Reference Architectures for Cloud Applications – Cloud Application Design Methodologies: Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), RESTful Web Services – Data Storage Approaches: Relational Approach (SQL), Non-Relational Approach (NoSQL).
IV	Cloud Application Benchmarking and Tuning: Introduction to Benchmarking – Steps in Benchmarking – Workload Characteristics – Application Performance Metrics – Design Consideration for Benchmarking Methodology – Benchmarking Tools and Types of Tests – Deployment Prototyping. Cloud Security: Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security : Securing data at rest, securing data in motion – Key Management – Auditing.
V	Case Studies: Cloud Computing for Healthcare – Cloud Computing for Energy Systems - Cloud Computing for Transportation Systems - Cloud Computing for Manufacturing Industry - Cloud Computing for Education.

Learning Resources:

Recommended Texts

1. Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India) Pvt. Ltd., 2018.

Reference Books

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013.
2. Barrie Sosinsky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013.
3. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2012.
4. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Big Data Analytics Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E5E**
Credits 3	**Lecture Hours: 4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Work with big data tools and its analysis techniques.
CO2: Analyse data by utilizing clustering and classification algorithms.
CO3: Learn and apply different mining algorithms and recommendation systems for large volumes of data.
CO4: Perform analytics on data streams.
CO5: Learn NoSQL databases and management.

Units	**Contents**
I	INTRODUCTION TO BIG DATA : Evolution of Big data — Best Practices for Big data Analytics — Big data characteristics — Validating — The Promotion of the Value of Big Data — Big Data Use Cases- Characteristics of Big Data Applications — Perception and Quantification of Value -Understanding Big Data Storage — A General Overview of High-Performance Architecture — HDFS — MapReduce and YARN — Map Reduce Programming Model
II	CLUSTERING AND CLASSIFICATION: Advanced Analytical Theory and Methods: Overview of Clustering — K-means — Use Cases — Overview of the Method — Determining the Number of Clusters — Diagnostics — Reasons to Choose and Cautions. - Classification: Decision Trees — Overview of a Decision Tree — The General Algorithm — Decision Tree Algorithms — Evaluating a Decision Tree — Decision Trees in R — Naïve Bayes — Bayes? Theorem — Naïve Bayes Classifier
III	ASSOCIATION AND RECOMMENDATION SYSTEM:Advanced Analytical Theory and Methods: Association Rules — Overview — Apriori Algorithm — Evaluation of Candidate Rules — Applications of Association Rules — Finding Association& finding similarity — Recommendation System: Collaborative Recommendation- Content Based Recommendation — Knowledge Based Recommendation- Hybrid Recommendation Approaches
IV	STREAM MEMORY: Introduction to Streams Concepts — Stream Data Model and Architecture — Stream Computing, Sampling Data in a Stream — Filtering Streams — Counting Distinct Elements in a Stream — Estimating moments — Counting oneness in a Window — Decaying Window — Real time Analytics Platform (RTAP) applications — Case Studies — Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

V	NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION: NoSQL Databases: Schema-less Models- Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores — Tabular Stores — Object Data Stores — Graph Databases Hive — Sharding —Hbase — Analyzing big data with twitter — Big data for E-Commerce Big data for blogs — Review of Basic Data Analytic Methods using R.

Learning Resources:

Recommended Texts

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CambridgeUniversity Press, 2012.

Reference Books

1. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration withTools, Techniques, NoSQL, and Graph”, Morgan Kaufmann/El sevier Publishers, 2013.

2. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: V**

Expert System	**326E5F**
Credits 3	**Lecture Hours:4 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)
To Understand

- Basic Concept of Expert Systems
- Components of expert systems, and development of an expert system
- The need for Expert Systems and Applications
- Knowledge Representation in expert systems
- Classes of Expert Systems
- Rule-based expert systems
- Frame-based expert systems
- Expert Systems Characteristics and Application

Course Outcomes: (for students: To know what they are going to learn)
CO1: Clear understanding of Expert Systems
CO2: Explain about AI techniques for knowledge representation, planning and uncertainty Management.
CO3: Develop knowledge of decision making and learning methods.
CO4: Describe the use of AI to solve English Communication problems.
CO5: Explain the concept of Knowledge Representation.

Units	**Contents**
I	The meaning of an expert system, problem domain and knowledge domain, the advantages of an expertsystem, general stages in the development of an expert system, general characteristics of an expertsystem, history and uses of expert systems today, rule-based expert systems, procedural andnonprocedural paradigms, characteristics of artificial neural systems. -The study of logic, differencebetween formal logic and informal logic, meaning of knowledge, how knowledge can be represented,semantic nets, how to translate semantic nets into PROLOG, limitations of semantic nets, schemas,frames and their limitations, how to use logic and set symbols to represent knowledge,
II	The meaning ofpropositional and first order predicate logic, quantifiers, limitations of propositional and predicate logicTrees, lattices, and graphs, state and problem spaces, AND-OR trees and goals, methods of inference,rules of inference, limitations of propositional logic, logic systems, resolution rule of inference,resolution systems, and deduction, shallow and causal reasoning, applying resolution to first-orderpredicate logic, forward and backward chaining,
III	Additional methods of reference, Meta knowledge, theMarkov decision process.The meaning of uncertainty and theories devised to deal with it, types of errors attributed touncertainty, errors associate, with induction, features of classical probability, experimental andsubjective probabilities, compound and conditional probabilities,

IV	hypothetical reasoning and backwardinduction, temporal reasoning, Markov chains, odds of belief, sufficiency and necessity, role ofuncertainty in inference chains, implications of combining evidence, role of inference nets in expertsystems, how probabilities are propagated.
V	Sources of uncertainty in rules, methods of dealing with uncertainty, Dempster-Shafer theory, theory ofuncertainty based on fuzzylogic, commercial applications of fuzzy logic. How to select an appropriateproblem, the stages in the development of an expert system, types of errors to expect in thedevelopment stages, the role of the knowledge engineer in the building of expert systems, the expectedlife cycle of an expert system, how to do a life cycle model.

Learning Resources:

1. J. Giarratano and G. Riley, "Expert Systems -- Principles and Programming". 4th Edition, PWSPublishing Company, 2004.

2. Durkin, J., Expert systems Design and Development, Macmillan, 1994 2. Elias M. Awad, BuildingExpert Systems, West Publishing Company 1996

3. Peter Jackson, Introduction to Expert Systems, Addison Wesley Longman, 1999.ISBN 0-20187686-8.

4. Gonzalez and D. Dankel, "The Engineering of Knowledge-Based Systems", Prentice Hall, 1994.

5. Nikolopoulos, "Expert Systems", Marcel Dekker Inc. 1997. ISBN 0 8247 9927 5

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Mobile Ad-hoc Network Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E6A**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
- To introduce students to artificial neural networks and fuzzy theory from a theoretical perspective

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basic concepts ad-hoc networks and ad-hoc mobility models.

CO2: Acquire knowledge about Medium access protocols and standards like IEEE 802.11a and HIPERLAN.

CO3: Identify the significance of Routing protocols and analyze about routing Algorithm.

CO4: Understand about the applications of end-end delivery and security issues in ad-hoc networks

CO5: Analyze and understand the concept of cross-layer design and parameter optimization techniques.

Units	**Contents**
I	Introduction: Introduction to ad-hoc networks – definition, characteristics features, applications. Characteristics of wireless channel, ad-hoc mobility models indoor and out-door models.
II	Medium Access Protocol: MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.
III	Network Protocols : : Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.
IV	End – end delivery and security: Transport Layer: Issues in designing – Transport layer classification, ad-hoc transport protocols. Security issues in ad-hoc networks: issues and challenges, network security attacks, secure routing protocols.
V	CROSS -LAYER DESIGN: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad-hoc with Mobile IP networks.

Learning Resources:

Recommended Texts

1. C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols II edition, Pearson Edition, 2007.
2. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

Reference Books

1. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-
2. hoc networking, Wiley-IEEE press, 2004.
3. Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
4. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad-hoc Network”
5. Research, “Wireless Commn. and Mobile Comp - Special Issue on Mobile Ad-
6. hoc networking Research, Trends and Applications”, Vol. 2, no. 5, 2002, pp. 483 – 502.
7. A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri
8. M. bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no:12007.

Web resources

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Data Mining and Warehousing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326E6B**
Credits 3	**Lecture Hours: 5 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To provide the knowledge on Data Mining and Warehousing concepts and techniques.
- To study the basic concepts of cluster analysis
- To study a set of typical clustering methodologies, algorithms, and applications

Course Outcomes: (for students: To know what they are going to learn)

CO1: To understand the basic concepts and the functionality of the various data mining and data warehousing component

CO2: To know the concepts of Data mining system architectures

CO3: To analyse the principles of association rules

CO4: To get analytical idea on Classification and prediction methods.

CO5: To Gain knowledge on Cluster analysis and its methods.

Units	Contents
I	Introduction: Data mining – Functionalities – Classification – Introduction to Data Warehousing – Data Pre-processing: Pre-processing the Data – Data cleaning – Data Integration and Transformation – Data Reduction
II	Data Mining, Primitives, Languages and System Architecture: Data Mining – Primitives – Data Mining Query Language, Architecture of Data mining Systems. Concept Description, Characterization and Comparison: Concept Description, Data Generalization and Summarization, Analytical Characterization, Mining Class Comparison – Statistical Measures
III	Mining Association Rules: Basic Concepts – Single Dimensional Boolean Association Rules From Transaction Databases, Multilevel Association Rules from transaction databases – Multi dimension Association Rules from Relational Database and Data Warehouses
IV	Classification and Prediction: Introduction – Issues – Decision Tree Induction – Bayesian Classification – Classification of Back Propagation. Classification based on ConceptsfromAssociationRuleMining–OtherMethods. Prediction – Introduction – Classifier Accuracy.
V	Cluster Analysis: Introduction – Types of Data in Cluster Analysis, Petitioning Methods – Hierarchical Methods-Density Based Methods – GRID Based Method – Model based Clustering Method

Learning Resources:

Recommended Texts

1. Han and M. Kamber, "Data Mining Concepts and Techniques", 2001, Harcourt India Pvt. Ltd, New Delhi.

Reference Books

1. K.P. Soman, Shyam Diwakar, V. Ajay "Insight into Data Mining Theory and Practice ",Prentice Hall of India Pvt. Ltd, New Delhi
2. Parteek Bhatia, 'Data Mining and Data Warehousing: Principles and Practical Techniques',Cambridge University Press, 2019

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

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester:I**

Skill Enhancement Course: Office Automation (Common to B.Sc.-CS, CS with DS, Software Appl. & BCA)	**126S1A**

Credits 2 **Lecture Hours:2 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point.
- The course is highly practice oriented rather than regular class room teaching.
- To acquire knowledge on editor, spread sheet and presentation software.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basics of computer systems and its components.
CO2: Understand and apply the basic concepts of a word processing package.
CO3: Understand and apply the basic concepts of electronic spreadsheet software.
CO4: Understand and apply the basic concepts of database management system.
CO5: Understand and create a presentation using PowerPoint tool.

UNITS	CONTENTS
I	Introductory concepts: Hardware and Software - Memory unit – CPU-Input Devices: Key board, Mouse and Scanner. Output devices: Monitor, Printer. Introduction to Operating systems - Introduction to Programming Languages.
II	Word Processing: File menu operations - Editing text – tools, formatting, bullets and numbering - Spell Checker - Document formatting – Paragraph alignment, indentation, headers and footers, printing – Preview, options, merge.
III	Spreadsheets: Excel – opening, entering text and data, formatting, navigating; Formulas – entering, handling and copying
IV	Charts – creating, formatting and printing, analysis tables, preparation of financial statements, introduction to data analytics.
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewing slides – creating slide shows. Applying special object – including objects & pictures – Slide transition – Animation effects, audio inclusion, timers.

Learning Resources:

Recommended Texts

1. Peter Norton, “Introduction to Computers” –Tata McGraw-Hill.

Reference Books

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGraw- Hill.

Web resources : Web content from NDL / SWAYAM or open source web resources

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: I **Semester: II**

Office Automation Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**126S21**
Credits 2	**Lecture Hours:2 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Power point.
- The course is highly practice oriented rather than regular class room teaching.
- To acquire knowledge on editor, spread sheet and presentation software.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand the basics of computer systems and its components.
CO2: Understand and apply the basic concepts of a word processing package.
CO3: Understand and apply the basic concepts of electronic spreadsheet software.
CO4: Understand and apply the basic concepts of database management system.
CO5: Understand and create a presentation using PowerPoint tool.

Contents

WORD

1. Create and save a document using MSWORD
   Deletion of Character, Word, line and block of text - Undo and redo process - Moving, Copying and renaming
2. Format the Text document
   Character formatting - Paragraph formatting - Page formatting
3. Spell check the document
   Finding and Replacing of text - Bookmarks and Searching for a Bookmarks - Checking Spelling and Grammar automatically - Checking Spelling and Grammar using Dictionary
4. Print the document
   Print Preview - Print Dialog box
5. Mail Merge in Ms-word
   Create main document and data file for mail merging - Merging the files - From letters using mail merging - Mailing labels using mail merging
6. Table creation in Ms-word
   Create a table in the document - Add row, column to a table - Changing column width and row height - Merge, split cells of table - Use formulae in tables - Sorting data in a table - Formatting a table.

EXCEL

1. Create and save a new work book in Excel
2. Entering Data into Work sheet
3. Editing data of Worksheet
4. Formatting the text in the cells
5. Formatting the numbers in the cells.

6. Formatting cells.
7. Copying format of cell along with data format.
8. Changing the height and width of cells.
9. Freezing Titles, splitting screen
10. Enter formulae for calculation in the cells.
11. Copying the formula over a range of cells.
12. Inserting built-in functions in to the cells.
13. Create graphs for the data using ChartWizard.
14. Format graphs in Excel.
15. Printing of work sheet.

POWER POINT

1. Create and save a new presentation using MS Power Point
    a) layout of opening screen in PowerPoint
    b) he tool bars in MS PowerPoint
2. Choose Auto Layout for a new slide.
3. Insert text and pictures into a blank slide.
4. Insert new slides into the presentation.
5. Apply slide transition effects.
6. Slide show.

    Set animation to text and pictures in a slide - Set the sounds, order and timing for animation

Learning Resources:

Learning Resources:

Recommended Texts

1. Peter Norton, “Introduction to Computers” –Tata McGraw-Hill.

Reference Books

1. Jennifer Ackerman Kettel, Guy Hat-Davis, Curt Simmons, “Microsoft 2003”, Tata McGraw- Hill.

Web resources : Web content from NDL / SWAYAM or opensource web resources

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: III**

Desktop Publishing Practical Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**226S32**
Credits 2	**Lecture Hours:2 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- The objective of the course is to provide the participants understanding of the techniques essential to build their career in desktop publishing using suitable hardware and software tools.
- This course offers a range of topics of immediate relevance to industry and makes the participants exactly suitable for DTP Industry.

Course Outcomes: (for students: To know what they are going to learn)

CO1: Understand basics of computer and its related terminology.

CO2: Write, Edit & Print documents using MS-WORD & EXCEL

CO3: Understand various software used for Desktop Publishing andwould be able to create and design documents with text and graphics like newspaper ad, wedding cards, visiting cards, greeting cards etc.

CO4: Using PageMaker, CorelDraw & Photoshop. Understand Colourconcept in Printing

Units	**Contents**
I	Computer Fundamentals - Generations of Computer, Advantage and disadvantage of Computer, Block Diagram of a Computer, Description of Different parts of a computer. System Software and Application Software MS Office Introduction to MS Office, Word Processing Software, Electronic Spreadsheet, MS Paint
II	PageMaker Introduction to various versions, concepts and applications of PageMaker Guides & rulers. Drawing tools. Fills & outlines Photo Shop -History & introduction, the file menu, the tools, Drawing lines & shapes Photo editing inserting starting with Setting Up, introduction of layers,Understanding Design principles and color theory
III	Coral Draw-Drawing-lines, shapes inserting-pictures, objects, tables, templates, Use of various tools such as Pick tools, Zoom tools, Free hand tool, square tool, rectangle tool, Text tool, Fill tool etc. and all fonts used in designing of monograms, logos, posters, stickers, greeting cards, wedding cards, visiting cards, etc Design Principles & Color Harmony Introduction to colors Primary and Secondary in both RGB & CMYK schemes/modes

List of Programs

1. Using windows explorer and other windows elements
2. Creating and opening a document in page maker
3. Formatting and editing a document
4. Saving and printing a given document
5. Insertion of text and graphics in a given document from external source

6. Using columns utility, to give the document column look
7. Using various fonts and styles to make a document more beautiful
8. Use of page maker to make transparencies
9. Saving and printing a file that has been created
10. Formatting a given file by using undo/redo, repeat, cut, copy, paste, delete, duplicate and clone utilities
11. Inserting objects in the drawing, aligning, ordering, grouping and ungrouping of those objects
12. Use of combine, break apart, weld, intersection, trim and separate tools in given drawing
13. Use of mode edit tools ie, to line, to curve, to stretch, and rotate
14. Creating special effects i.e, transform roll-up, envelop roll up, add perspective, extrude roll up, contour roll up, power line, power clip, clear effects
15. To insert character and paragraph text in a drawing and frame, setting of tabs, indents, bullets and spacing in paragraph text
16. Filling of text to a given path, aligning it to base line, straighten text and edit text
17. Using tools such as spell checker, and thesaurus
18. Using find and replace text utility and type assist
19. Adding various symbols to a drawing and creating different pattern

Learning Resources:

1. Desk Top Publishing From A to Z by Bill Grout and Osborne; McGraw Hill
2. DTP (Desk Top Publishing) for PC user by Houghton; Galgotia Publishing House Pvt. Ltd., Daryaganj, New Delhi.
3. ADOBE PAGEMAKER 6.5 - Shashank Jain & Satish Jain - First Edition 2001, BPB Publications
4. DESKTOP PUBLISHING ON PC-M.C. Sharma, BPB Publications
5. Corel draw the Official Guide By Gray David Bouton, Corel Press.
6. The complete Reference Getting Started with Page Maker, McGraw-Hills
7. Adobe Photoshop CS2 Classroom In A Book (2020), Adobe Press.
8. Computers Today S.K.Basandra, Galgotia Publications.
9. Microsoft Office: Will Train, Gini Courter, Annette Marquis BPB Publication.

Suggested equivalent online courses:

http://www.nptelvideos.com/adobe/adobe photoshop tutorials.php

https://onlinecourses.swayam2.ac.in/cec20 cs05/preview

https://eskillindia.org/Course/course detail/11720692020022105164 7

https://www.udemy.com/course/desktop-publishing-for-you/

https://www.youtube.com/watch?v=FJYgNUYUvZe

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Emotional Intelligence Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**226S4A**
Credits 2	**Lecture Hours: 2 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- To enable the students to understand the concepts of emotional intelligence
- To teach the students on aspects relating to personality Analysis Self-analysis, Positive and Negative traits

Course Outcomes: (for students: To know what they are going to learn)

1. After completion of subjects students understand and application of Emotional Intelligence.

Units	Contents
I	Introduction – Emotional Intelligence – Meaning, Benefits, *Importance of emotions – Self –awareness and competencies Psychological Needs, Emotional quotient Vs. IntelligenceQuotient.
II	Personality Analysis – Distinct Personality Type – Handwriting Analysis, color preference,listening, profile, self-esteem, *Will Power, Confidence.
III	Negative Traits – Anger Management – Negative Syndrome and Attitude - Negativethinking – Guilt Quotient Stress and Emotion, Adapting to Loneliness.
IV	Positive Traits – Humor and Happiness – Empathetic ability - Sensitivity profile – Empowered personality, Self – Empowerment.
V	Self-analysis: Psychological growth and adjustment - Personal Development Plan – Successful negotiator personal SWOT Analysis, Celebrating Life.

Reference Books:

1. Dr. Aparna Chattopadhyaym What's Your Emotional IQ, Pustak Mahal, May 2004.
2. Jill Dann, Hodder & Stoughton, Emotional Intelligence In a Week, 10 Edition, 2007.
3. Daniel Goleman, Emotional Intelligence: Why It can matter More than IQ.

UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: II **Semester: IV**

Technical Writing Common for B.C.A. , B.Sc.-SA , B.Sc.-CSc , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**226S4B**
Credits 2	**Lecture Hours: 2 per week**

Learning Objectives: (for teachers: what they have to do in the class/lab/field)

- This course is designed to guide students towards rhetorical, professional, and compositional competencies necessary to ethically and effectively create and analyse technical documents and communication.
- Technical communication competency will be accomplished through a structured exploration of professional/technical contexts and through the production of several documents and projects typical to many forms of technical writing

Course Outcomes: (for students: To know what they are going to learn)

1. Students will learn to analyse communication-related problems and develop solutions through the composition of technical documents from a number of genres and within several settings (i.e., print, web, interactive software) and contexts (e.g., academic, corporate, non-profit, governmental).
2. Students will explore rhetorical and professional strategies in order to discover howto clearly identify and address audiences and stakeholders, organizational contexts, and ethical concerns in the act of communication

Units	**Contents**
I	What is technical writing?Difference between technical writing and other forms of writing. Qualities and qualifications of technical writers.
II	End products of technical writing.professionalsinvolved-projectmanager/editor,writers, graphic artists; liaison with product engineers/scientists and clients.
III	Roles and responsibilities of writers, editors/project managers.7 Cs of effective writing:Document formats – hard and soft copy versions designs.
IV	Principlesoftechnicalwriting;stylesintechnicalwriting;clarity,precision,coherenceand logical sequence in writing.
V	Stages of Technical writing. Document development process, Technical documentation, Planning, Tools, architecture, templates, content development, technical reviews, editorial reviews. Quality control.

Books for References

1. Technical writing style by – Dan Jones , Sam Dragga
2. Handbook of Technical writing by- Walter.E.ollu -1976
3. Technical Writing by- Serena Henning
4. Technical writing process by – Kieran Morgan and Sanja Spejic -2015
5. A guide to technical writing by – T.A. Rickard

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B.Sc. DEGREE PROGRAMME IN COMPUTER SCIENCE WITH ARTIFICIAL INTELLIGENCE

SYLLABUS WITH EFFECT FROM 2023-2024

Year: III **Semester: VI**

Mini Project Common for B.C.A. , B.Sc.-CSc-wAI , B.Sc.-CSc-wDS	**326S61**
Credits 2	**Lecture Hours: 2 per week**

Student Mini-Project Instructions:

Objective:
Mini-project aims to demonstrate student's understanding and application of course concepts. It consists of three components: a comprehensive report, software development, and an external presentation (viva).

Development Process:

- **Planning:** Define project scope, objectives, and required functionalities.
- **Execution:** Follow a structured development process with clear milestones.
- **Documentation:** Maintain a detailed report covering methodology, design, implementation, and testing.

Components for Evaluation:

1. **Mini-Project Report:** Ensure completeness, clarity, and adherence to guidelines.
2. **Software Development:** Create a fully functional application meeting specified requirement.
3. **External Presentation (Viva):** Communicate and defend your project effectively to external evaluators.

Specifications:

- **Functional Requirements:** List essential features the software must incorporate.
- **Non-functional Requirements:** Consider performance, security, usability, etc.
- **Technologies:** Specify programming languages, frameworks, and tools to be used.

Submission Guidelines:

- Follow a prescribed report format and submission method for the software.
- Prepare concise and engaging materials for the external presentation.

Support and Integrity:

- Seek guidance from mentors and utilize available resources.
- Ensure originality and adhere to ethical standards in your work.

Evaluation Criteria:

- Creativity, functionality, documentation quality, and presentation skills are key assessment areas.

UNIVERSITY OF MADRAS
U.G. DEGREE COURSE

ENVIRONMENTAL STUDIES PROGRAMME
ABILITY ENHANCEMENT COMPULSORYCOURSES
(AECC- Environmental Studies)
Syllabus with effect from the academic year 2018-2019
(i.e. for batch of candidates admitted to the course from the academic year 2017-18)

Credits: 2 II Year / III/IV Sem.

Unit 1: Introduction to Environmental Studies

- Multidisciplinary nature of environmental studies;
- Scope and importance; concept of sustainability and sustainable development.

Unit 2 : Ecosystem (2 lectures)

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem:
  Food chains, food webs and ecological succession, Case studies of the following ecosystem:
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystem (ponds, stream, lakes, rivers, ocean, estuaries)

Unit 3: Natural Resources : Renewable and Non – renewable Resources (6 lectures)

- Land resources and landuse change: Land degradation, soil erosion and desertification.
- Deforestation : Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water : Use and over –exploitation of surface and ground water, floods, droughts, conflicts over water (international and inter-state).
- Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit 4: Biodiversity and Conservation (8 lecturers)

- Levels of biological diversity: genetics, species and ecosystem diversity, Biogeographic zones of India: Biodiversity patterns and global biodiversity hot spots
- India as a mega- biodiversity nation, Endangered and endemic species of India.
- Threats to biodiversity: Habitat loss, poaching of wildlife, man- wildlife conflicts, biological invasions; Conservations of biodiversity: In-situ and Ex-situ Conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit 5: Environmental Pollution (8 lecturers)

- Environmental pollution: types, causes, effects and controls: Air, Water, soil and noise Pollution.
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste
- Pollution case studies.

Unit 6: Environmental Policies & Practices (8 lecturers)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act, Air (Prevention & Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human Wildlife conflicts in Indian context.

Unit 7: Human Communities and the Environment (7 lectures)

- Human population growth, impacts on environment, human health and welfare.
- Resettlement and rehabilitation of projects affected persons; case studies.
- Disaster management: floods, earthquake, cyclone and landslides.
- Environmental movements : Chipko, Silent Valley, Bishnois of Rajasthan.
- Environmental ethics : Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies(e.g. CNG Vehicles in Delhi)

Unit 8 : Field Work (6 lectures)

- Visit to an area to document environmental assets: river / forest/ flora/ fauna etc.
- Visit to a local polluted site – Urban / Rural/ Industrial/ Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystem- pond, river, Delhi Ridge etc.

(Equal to 5 Lectures)

Suggested Readings:

1. Carson , R. 2002.Slient Spring, Houghton Mifflin Harcourt.
2. Gadgil , M.,& Guha, R. 1993.This Fissured Land: An Ecological History of India. Univ.of California Press.
3. Glesson, B. and Low, N.(eds.)1999. Global Ethics and Environment, London, Routledge.
4. Gleick,P.H.1993.Water Crisis. Pacific Institute for Studies in Dev.,Environment & Security. Stockholm Env.Institute, Oxford Univ.Press.
5. Groom, Martha J., Gary K.Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates,2006.
6. Grumbine,R.Edward, and Pandit,M.K2013.Threats from India's Himalayas dams .Science,339:36-37
7. McCully,P.1996.Rivers no more :the environmental effects of dams(pp.29-64).Zed books.
8. McNeill,John R.2000.Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum,E.P.,Odum, H.T.& Andrees,J.1971.Fundamental of Ecology. Philadelphia Saunders.
10. Pepper,I.L.,Gerba,C.P & Brusseau,M.L.2011.Environmental and Pollution Science. Academic Press.
11. Rao,M.N.& Datta,A.K1987.Waste Water Treatment. Oxford and IBH Publishing Co.Pvt.Ltd.
12. Raven,P.H.,Hassenzahl,D.M & Berg,L.R.2012 Environment.8th edition. John Willey & sons.

13. Rosencranz, A., Divan,S.,& Noble, M.L.2001.Environmental law and policy in India. Tirupathi 1992.
14. Sengupta,R.2003.Ecology and Economics: An approach to sustainable development.OUP
15. Singh,J.S.,Singh,S.P and Gupta,S.R.2014.Ecology,Environmental Science and Conservation. S.Chand Publishing, New Delhi.
16. Sodhi,N.S.,Gibson,L.&Raven ,P.H(eds).2013.Conservation Biology :Voices from the Tropics. John Willey & Sons.
17. Thapar,V.1998.Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren,C.E.1971.Biology and water Pollution Control. WB Saunders.
19. Willson,E.O.2006. The Creation: An appeal to save life on earth..New York: Norton.
20. World Commission on Environment and Development.1987.Our Common Future. Oxford University Press.

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UNIVERSITY OF MADRAS
U.G. DEGREE COURSE

PART – IV - VALUE EDUCATION

Common for all U.G. & Five Year Integrated Courses
(Effective from the Academic Year 2012 – 2013)

SYLLABUS

CREDITS: 2 **III YEAR / V SEM**

Objective: Value are socially accepted norms to e valuate objects, persons and situations that form part and parcel of sociality. A value system is a set of consistent values and measures. Knowledge of the values are inculcated through education. It contributes in forming true human being, who are able to face life and make it meaningful. There are different kinds of values like, ethical or moral values, doctrinal or ideological values, social values and aesthetic values. Values can be defined as broad preferences concerning appropriate courses of action or outcomes. As such, values reflect a person's sense of right and wrong or what "ought" to be. There are representative values like, "Equal rights for all", "Excellence deserves admiration". "People should be treated with respect and dignity". Values tend to influence attitudes and behavior and help to solve common human problems. Values are related to the norms of a culture.

UNIT I: Value education-its purpose and significance in the present world – Value system – The role of culture and civilization – Holistic living – balancing the outer and inner – Body, Mind and Intellectual level – Duties and responsibilities.

UNIT II: Salient values for life – Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity, and inclusiveness, Self esteem and self confidence, punctuality – Time, task and resource management – Problem solving and decision making skills – Interpersonal and Intra personal relationship – Team work – Positive and creative thinking.

UNIT III: Human Rights – Universal Declaration of Human Rights – Human Rights violations – National Integration – Peace and non-violence – Dr.A P J Kalam's ten points for enlightened citizenship – Social Values and Welfare of the citizen – The role of media in value building.

UNIT IV: Environment and Ecological balance – interdependence of all beings – living and non-living. The binding of man and nature – Environment conservation and enrichment.

UNIT V: Social Evils – Corruption, Cyber crime, Terrorism – Alcoholism, Drug addiction – Dowry – Domestic violence – untouchability – female infanticide – atrocities against women – How to tackle them.

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