



SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

School of Computing

Department of Computer Science & Engineering

1.2.1 New Courses Introduced in 2023- 2024

CONTENTS

S. No.	Course Code	Course Name	Page No.
1	S11BLH11	Programming in C	2
2	S11BLH21	Programming in Python	5
3	SCSB5201	AI and ML	7
4	SCSB5101	Cloud Computing and Virtualization	9

S11BLH11	PROGRAMMING IN C	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

COURSE OBJECTIVES

- ☐ To understand the concepts of variables, operators, control structures and arrays.
- ☐ To gain knowledge on functions, structures and union in C.
- ☐ To explore the concepts of pointers and files to create real world applications using C.

UNIT 1 BITS AND BYTES IN COMPUTING

12 Hrs.

Computers: Hardware – Software – Processor – Memory – I/O devices – Interface – Programming Languages – Evolution from COBOL, FORTRAN to C, Python – Need

Algorithms: Role in problem solving – Analysis – Design – Flowcharts: Role in problem solving – Symbols – Design –

Pseudo code: Role in problem solving – Design – Program: Role in problem solving – Design Practical:

- Describe a simple real world problem in your domain of interest and describe it in the form of problem statement, input, output and provide its solution in terms of algorithm, flowchart, pseudo code and program.

UNIT 2 C: MATH BEHIND CODING

12 Hrs.

C: Structure of program – Character set – Tokens – Keywords – Identifiers – Constants – Variables – Data types – Strings – Operators and its types – Functions – Header Files

Algorithmic Strategies: Iteration and Recursion – Efficiency – Role of time and space consumption while building an algorithm – Complexities

Practical:

- Describe a simple real world problem in your domain of interest and provide a computing and non-computing solution for the same. Calculate the time and space consumed in both solutions. Compare and contrast the pros and cons in both solutions.
- Write an algorithm, flowchart, pseudo code followed by a simple C code to do find the Factorial and Fibonacci series using both iteration and recursion.
- Input the number of days taken to cultivate both rice and wheat in turns in an agricultural land from the user. Write a C program to display the days as years, months and days using simple operators.
- You have a circular plot for building playground and a rectangular plot for building an apartment. Get the input from the user for both plots and write a C program to calculate the area and perimeter of both plots.

UNIT 3 C: MAGIC BEHIND INSTANT OUTPUTS

12 Hrs.

Advanced coding concepts: Decision Making using branching statements and its types – Decision making using looping statements and its types – Switch statements – Break – Continue – Goto – Jump statements.

Case Study: Fun with Code -- Printing Alphabets / Flags of Countries / Flying Alphabet Screensaver. Practical:

- Describe a problem statement in your domain of interest whose solution involves repetition of same steps and provide code as solution involving for, while and do while loops.
- Describe a problem statement in your domain of interest whose solution involves decision making and provide code as solution involving if-else, nested if-else and ladder if-else.
- Develop a simple scientific calculator using Switch case statement.
- A Cartesian co-ordinate system has four quadrants. Write a C program to find the quadrant of the co-ordinate points given by the user using both if-else and nested if-else control structure.
- Given a rose flower to you, dismantle the petals of the flower from inside, if you notice - it

follows the sequence of Fibonacci. Now, try to arrange the word "PIZZA" in several ways without repeating and calculate number of ways it can be done using factorial concept. Write a C program to find both Fibonacci and factorial by getting the mentioned input.

1. Product of two large prime numbers is used as encryption key in encryption algorithms. Write a C program to display all the prime numbers between 1 to 100 and give the first two largest numbers as the output.

UNIT 4 STORING GROUP OF HOMOGENOUS ELEMENTS: ARRAYS 12 Hrs.

Diving into Arrays: Definition – Syntax – Types – Representation: Row and Column Order – Dynamic Arrays.

Idea behind functions: Declaration – Definition – Types – Calling – Arguments – Prototypes – Call by Value – Call by Reference – Pointers – Amalgamation of Pointers with Arrays and Strings.

Case Study: Fun with Code – Simple Game Development using Arrays and Functions. Practical:

- Describe a problem statement in your domain of interest where you need to work with group of same type of data. Provide a solution in terms of C program to store and manage the data effectively.
- You're playing UNO cards, suddenly a person is getting rev card. Write a C program to reverse the round by storing the number of players in array.
- Write a C program for Vehicle Regulation System where odd number ending vehicles can use the road on odd days and even number ending vehicles can use the road on even days using two separate arrays to store and display the odd and even numbers.
- Write a C program to do the following applications in array:
 - a. (i). Get set of positive and negative integers from user, replace positive integers by 0 in the array.
 - b. (ii). Reverse the floating point numbers stored in the array.
 - c. (iii). Return the smallest value and largest value position in the array.
 - d. (iv). Search the number '5' in array and replace it with '10'
- Write C program to do the following string handling applications.
 - a. (i). Get favourite actor and actress name, concatenate it and display
 - b. (ii). Display your name in uppercase, lowercase and as fname and lname.
 - c. (iii). Count the frequency of "the" in any sentence and delete it from sentence.
 - d. (iv). Check whether the given string is a palindrome or not.
- Write a C program for counting the total number of duplicate elements in an array, print all the unique elements in the same array as two different functions.
- Write a C program to sort the elements in an array in both ascending and descending order using two different functions.
- Write a C program to find the largest and smallest number in an array using recursion and to convert the output into a binary number.
- Write a C program to swap two numbers using two functions, one using pointers and the other one without using pointers.

UNIT 5 STORING GROUP OF HETEROGENOUS ELEMENTS: STRUCTURE 12 Hrs.

Outset of Structure and Union: Structure definition and declaration – Structures fusion with Arrays – Pointers – Functions – Union initiation, Definition and declaration – Memory allocation- Static and dynamic Working with Files: File handling functions – Read – Write – Other operations – Different file types Case Study:

Report on using file functions to create score board for any game, importing it to program Practical:

- Describe a problem statement in your domain of interest where you need to work with group of different type of data. Provide a solution in terms of C program to store and manage the data effectively.

- Write a C program to get the details of the student (roll no, name, date of birth, state, 10th percentage and 12th percentage) using structure. Calculate the age of the student and display the eligibility status for his admission.
 - a. Eligibility criteria: more than 60 percent in 10th and 12th, age>=17, state==TN.
- Write a menu driven C program for library management system with ten entries: a. (i). Add Book (ii). Add Author (iii). Add Category (iv). Book Cos (v). Display - Book by Author, Book by Category, Book under cost
- Write a C program to create an employee Union with employee details (id, name, salary) Accept the details of 'n' employees, rearrange the data in ascending order of employee name, id and salary as three different functions and display it.

Complex Practice Problems

- Design a C program by creating your own header file for any function of your choice and display the output by calling the header file.
- Create TIC-TAC-TOE game using C Language.
- Given a situation, you are going to ATM to withdraw money. Write a C program, get the money requested from the user as input and display the number of possible bank notes for the requested money. Note: Give input as number ending in 0's or 5's.
- Develop a C program for managing Car Rental process with various modules for registration as new user, login, get id proof, keep track of cars available and cars given for rental.
- Create SUDOKU game using C Language.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Interpret the difference between components of problem solving such as algorithm, flowchart, pseudo code and source code.

CO2 - Build simple solutions for any given problem statement using various components of problem solving techniques and measure its efficiency in terms of time and space.

CO3 - Examine the roots and foundation of C programming's key concepts like Data types, Operators. **CO4** - Design applications using different core concepts such as Arrays and Functions in C language. **CO5** - Formulate real time solutions through programs using Structure and Union in C language.

CO6 - Develop various applications for solving real time societal problems.

TEXT / REFERENCE BOOKS

1. Yashavant Kanetkar, —Let us C, BPB Publications, 14th Edition, 2019.
2. R.G.Dromey, —How to Solve it by Computer!, Pearson Education, 2008..
3. Balagurusamy, —Programming in ANSI C, McGraw Hill Publications, 8th Edition, 2019.
4. Greg Perry, Dean Miller —C Programming Absolute Beginner's Guidel, 3rd Edition, 2013.

S11BLH21	PROGRAMMING IN PYTHON	L	T	P	EL	Credits	Total Marks
		3	0	2	1	4	100

COURSE OBJECTIVES

- ☐ To learn data structures concepts like lists, tuples, and dictionaries in Python.
- ☐ To build packages with Python modules for reusability and handle user/custom exceptions.
- ☐ To create real world GUI applications, establish database connectivity and networking.

UNIT 1 INTRODUCTION TO PYTHON

12 Hrs.

History of Python- Introduction to the IDLE interpreter (shell) - Data Types - Built-in functions – Conditional statements - Iterative statements- Input/output functions - Python Database Communication
- Data analysis and visualization using Python.

Practical:

- Implement built-in functions and trace the type of data items.
- Implement concepts of Conditional and Iterative Statements.
- Use the built-in csv module to read and write from a CSV file in Python.
- Perform data analysis and visualization on a given dataset using Python libraries like pandas, numpy, matplotlib and display charts, graphs, and plots.

UNIT 2 OBJECT ORIENTED CONCEPTS

12 Hrs.

Class – Objects – Constructors – Polymorphism – Encapsulation -Inheritance -Data Abstraction-Method Overloading-Method Overriding-Database Access-Data Hiding-Import Class.

Practical:

- Execute concepts on Polymorphism, Encapsulation.
- Implement Data Abstraction and Inheritance.
- Differentiate Method Overloading and Overriding.
- Create a class called "Person" with attributes "name" and "age." Make the "age" attribute private and implement a getter method to access it.
- Create a module called "math_operations.py" with a class called "Calculator." Import the "Calculator" class into another script and use its methods to perform mathematical operations.

UNIT 3 FILES AND EXCEPTIONS HANDLING, MODULES, PACKAGES

12 Hrs.

File Operations –Iterators - Exception handling - Regular Expressions- Functions and modules-Import Statement
Introduction to PIP-Installing Packages via PIP-Using Python Packages.

Practical:

- Create a text file called "numbers.txt" and write the numbers from 1 to 10 in words, each on a separate line.
- Implement a custom iterator that generates a sequence of Fibonacci numbers and print the first 10 numbers.
- Create a try-except block to catch a File Not Found Error and print a message when a file is not found.
- Write a Python program that handles a Zero Division Error and prints a custom error message to the console.
- Create a module called "greetings.py" with a function called "hello" that prints "Hello, World!" Import the module into another script and use the "hello" function.
- Install the numpy package using PIP, import the package and create a numpy array with random values.

UNIT 4 GUI PROGRAMMING**12 Hrs.**

GUI programming in Python - Introduction to GUI library - Layout management - Events and bindings - Fonts – Colors - Canvas - Widgets (frame, label, button, check box, entry, list box, message, radio button, text, spin box).

Practical:

- Design a GUI form with a vertical box layout that includes labels and entry fields for user registration information.
- Create a GUI window with a grid layout that contains buttons representing a 3x3 game board.
- Create a canvas in your GUI program and draw simple shapes such as rectangles, circles, and lines.
- Create a GUI form program that includes various widgets and implement event handling Concepts also add Create a drop-down menu that allows users to select different font styles for text display.

UNIT 5 DATABASE AND NETWORK**12 Hrs.**

Database (using NoSQL): Connector Module –Cursor – Statements - Exceptions in database. Networkconnectivity: Socket module - Client – Server –Email – URL Access.

Practical:

- Connect to the NoSQL database using a Python connector module, such as "pymongo" for MongoDB or "cassandra-driver" for Cassandra.
- Use a cursor to iterate over the records in a collection/table and print specific fields/attributes.
- Implement error handling for specific scenarios, such as duplicate key violation or record not found, in the NoSQL database.
- Implement either a TCP/IP or UDP client-server application using the socket module for sending and receiving messages.
- Write a program using the smtplib module to send an email from a specified email address to another recipient.

Max. 60 Hrs.**COURSE OUTCOMES**

On Completion of the course the student will able to

CO1 - Describe the numbers, math functions, strings, list, tuples and dictionaries in Python. **CO2** -

Develop simple applications in Python using object oriented programming concepts. **CO3** -

Design GUI applications in Python and evaluate different database operations.

CO4 - Design client server network applications using Python.

CO5 - Design solutions to real life problems.

CO6 - Apply the best features of mathematics, engineering and natural sciences to program real life problems.

TEXT / REFERENCE BOOKS

1. R. Nageswara Rao , —Core Python ProgrammingI, Dreamtech Press, 3rd Edition, 2021
2. Y. Daniel Liang, —Introduction to Programming Using PythonI, Pearson,2013.
3. Python Notes for Professionals by Stack Overflow Documentation (<https://books.goalkicker.com/PythonBook/>).
4. Dr. Charles R. Severance, —Python for Everybody- Exploring Data Using Python 3I, 2016.
5. Paul Gries, Jennifer Campbell, Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3I, Pragmatic Bookshelf, 2nd Edition,2014.

SCSB5101	CLOUD COMPUTING AND VIRTUALIZATION	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

COURSE OBJECTIVES

- To understand basic concepts of cloud computing , virtualization and computer networks.
- To provide the fundamental and essentials of cloud computing services.
- To explore the security threats and solutions in cloud.

UNIT 1 UNDERSTANDING CLOUD COMPUTING

9 Hrs.

History of Cloud Computing - Cloud Computing Reference Model - NIST Architectural Framework - Types of Clouds- Pros and cons of Cloud Computing -Difference between Web 2.0 and Cloud - Key Challenges in Cloud Computing - Major Cloud Players - Cloud Deployment Models - Virtualization in Cloud Computing- Types of Virtualization - Web services - Key concepts.

UNIT 2 CLOUD SERVICE MODELS

9 Hrs.

Software as a Service (SaaS) - Infrastructure as a Service (IaaS)- Platform as a Service (PaaS)- Service Oriented Architecture (SoA) - Elastic Computing - On-Demand Computing - Parallelization in Cloud Computing - Cloud Resource Management - Dynamic Resource Allocation- Optimal Allocation of Cloud Models.

UNIT 3 CLOUD DEPLOYMENT MODELS

9 Hrs.

Deployment Models: Public Cloud - Private Cloud -Hybrid Cloud - Community Cloud - Deployment of Applications on the Cloud - Hypervisor - Case Studies- Xen - Hyper V - Virtual Box - Eucalyptus - Amazon Cloud Computing - Amazon S3 - Amazon EC2- - Windows Azure - Creating Deploying Cloud Services - Working with Google Appengine - Disaster Recovery.

UNIT 4 VIRTUALIZATION

9 Hrs.

Cloud Data Centers - Energy Efficiency in Data Centre - Mobile Cloud Computing Service Models- Need for Virtualization - Types of Virtualization - Virtualization OS - VMware - KVM - System VM - Process VM - Virtual Machine Monitor - Properties - Interpretation and Binary Translation - HLL VM.

UNIT 5 CLOUD SECURITY

9 Hrs.

Cloud Security - Security Threats and Solutions in Clouds - Auditing Protocols - Dynamic Auditing - Storage Security -Privacy Preserving - Fully Homomorphic Encryption - Big Data Security- Cloud Availability- Dos Attacks - Fault Tolerance Management in Cloud Computing- Cloud Computing in India.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Differentiate between various cloud deployment models,service models and cloud providers.
- CO2** - Deploy, configure,and manage virtual machines using hypervisors and virtualization software.
- CO3** - Develop and deploy cloud-native applications and micro services using cloud platforms and APIs.
- CO4** - Apply the concepts to design and deploy cloud-based solutions.
- CO5** - Understand emerging cloud trends and technologies such as serverless computing,edge

computing, and AI.

C06 - Analyze various cloud programming models and apply them to solve problems on the cloud.

TEXT / REFERENCE BOOKS

1. Anthony T.Velte,Toby J. Velte Robert Elsenpeter , "Cloud computing a practical approach", Tata McGraw-Hill, 2017.
2. Michael Miller , Que,"Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate",Online,2008.
3. Bible , Barrie Sosinsky, "Cloud Computing",Wiley,2010.
4. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski , "Cloud Computing: Principles and Paradigms", Wiley, 2011.
5. Antonopoulos, Lee, Gillam Nikos, "Cloud Computing: Principles - Systems and Applications", Springer, 2012.
6. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud Computing",Wiley India, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice**30 Marks****PART B:** 2 Questions from each unit of internal choice - each carrying 14 Marks**70 Marks**

SCSB5201	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	L	T	P	EL	Credits	Total Marks
		3	1	0	1	3	100

COURSE OBJECTIVES

- To introduce basic artificial intelligence concepts, methodologies, and applications.
- To learn about different algorithms and their applicability in real-world scenarios.
- To understand the features of machine learning to apply on real world problems.

UNIT 1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9 Hrs.

Introduction to AI- Intelligent Agent -Search Methods and Knowledge representation- Use cases of AI - Role of Machine Learning- Machine Learning Tools & Package.

UNIT 2 ARTIFICIAL INTELLIGENCE 9 Hrs.

Plotting for exploratory data analysis (EDA) - Linear Algebra- Probability and Statistics- Dimensionality reduction and Visualization: PCA (principal component analysis)- (t-SNE) T-distributed Stochastic Neighborhood Embedding.

UNIT 3 REAL WORLD PROBLEM 9 Hrs.

Real world problem: Predict rating given product reviews on Amazon- Classification and Regression Models: K-Nearest Neighbors- Classification algorithms in various situations- Performance measurement of models- Naive Bayes- Logistic Regression- Linear Regression- Solving Optimization Problems.

UNIT 4 MACHINE LEARNING ALGORITHMS 9 Hrs.

Support Vector Machines (SVM)- Decision Trees-Ensemble Models- Random Forest-Unsupervised Learning- K-Means Clustering - Ridge Regression.

UNIT 5 CASE STUDIES 9 Hrs.

Quora question Pair Similarity Problem- Personalized Cancer Diagnosis-Facebook Friend Recommendation using Graph Mining-Taxi demand prediction in Indian Cities-Stack overflow tag predictor- Microsoft Malware Detection.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** - Apply AI techniques to find solutions to a variety of engineering applications.
- CO2** - Understand the fundamental concepts involved in developing effective AI systems.
- CO3** - Interpret the various classification algorithms and its efficiency.
- CO4** - Demonstrate proficiency in applying scientific method to models of machine learning..
- CO5** - Investigate the issues involved in building solutions for real-world applications.
- CO6** - Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

TEXT / REFERENCE BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence- A Modern Approach", 4th Edition, Pearson Education, 2022.
2. Em Alpaydin, "Introduction to Machine Learning", MIT Press, 4th Edition, 2020.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice - each carrying 14 Marks

70 Marks