

**UNIVERSITY SCHOOL
OF
INFORMATION AND COMMUNICATION TECHNOLOGY**

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND 4IR TECHNOLOGIES

PROGRAMME STRUCTURE

**B.TECH. COMPUTER SCIENCE AND ENGINEERING
SPECIALIZATION IN INTERNET OF THINGS
2021-2025**



**GAUTAM BUDDHA UNIVERSITY
GAUTAM BUDH NAGAR, GREATER NOIDA, UP, INDIA**

SEMESTER I

| S.No. | Course Code | Course Name | L | T | P | Credits | Types | |
|--------------------------------|-------------|--------------------------------------|------------|----------|----------|-----------|-------------|--|
| 1 | CS103 | Fundamentals of Computer Programming | 3 | 1 | 0 | 4 | CC1 / FC | |
| 2 | CI103 | Fundamentals of Internet of Things | 2 | 0 | 0 | 2 | CC2 / FC | |
| 3 | MA101 | Engineering Mathematics-I | 3 | 1 | 0 | 4 | GE1 | |
| 4 | PH102 | Engineering Physics | 3 | 1 | 0 | 4 | GE2 | |
| 5 | EC101 | Basic Electronics Engineering | 3 | 1 | 0 | 4 | GE3 / FC | |
| 6 | EN101 | English Proficiency | 2 | 0 | 0 | 2 | OE1 / AECC | |
| 7 | CE103 | Engineering Graphics Lab | 1 | 0 | 2 | 2 | GE-L1 | |
| 8 | CS181 | Computer Programming Lab | 0 | 0 | 2 | 1 | CC-L1 / SEC | |
| 9 | PH104 | Engineering Physics Lab | 0 | 0 | 2 | 1 | GE-L2 | |
| 10 | EC181 | Basic Electronics Engineering Lab | 0 | 0 | 2 | 1 | GE-L3 | |
| 11 | GP | General Proficiency | Non Credit | | | | | |
| Total Hours and Credits | | | 17 | 4 | 8 | 25 | | |

SEMESTER II

| S.No. | Course Code | Course Name | L | T | P | Credits | Types | |
|--------------------------------|-------------|--|------------|----------|----------|-----------|-------------|--|
| 1 | CI102 | Introduction to Python | 2 | 0 | 0 | 2 | CC3 / FC | |
| 2 | CI104 | Computer Organization and Architecture | 3 | 0 | 0 | 3 | CC4 / SEC | |
| 3 | MA102 | Engineering Mathematics-II | 3 | 1 | 0 | 4 | GE4 | |
| 4 | EE102 | Basic Electrical Engineering | 3 | 1 | 0 | 4 | GE4 | |
| 5 | ME101 | Engineering Mechanics | 3 | 1 | 0 | 4 | GE6 | |
| 6 | ES101 | Environmental Studies | 3 | 1 | 0 | 4 | OE2 / AECC | |
| 7 | CI182 | Python Programming Lab | 0 | 0 | 2 | 1 | CC-L2 / SEC | |
| 8 | CI184 | Computer Organization and Architecture Lab | 0 | 0 | 2 | 1 | CC-L3 / SEC | |
| 9 | EE104 | Basic Electrical Engineering Lab | 0 | 0 | 2 | 1 | GE-L4 | |
| 10 | ME102 | Workshop Practice | 1 | 0 | 2 | 2 | GE-L5 | |
| 11 | GP | General Proficiency | Non Credit | | | | | |
| Total Hours and Credits | | | 16 | 4 | 8 | 26 | | |

SEMESTER III

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|---|------------|----------|----------|-----------|-------------|
| 1 | CI201 | Internet Technology | 3 | 0 | 0 | 3 | CC5 / SEC |
| 2 | CI203 | Operating Systems | 3 | 0 | 0 | 3 | CC6 |
| 3 | CI205 | Data Structure & Algorithms | 3 | 0 | 0 | 3 | CC7 / SEC |
| 4 | CI207 | Advanced Micro-Controller Based Systems | 3 | 0 | 0 | 3 | CC8 |
| 5 | CI209 | Sensors and Devices | 3 | 0 | 0 | 3 | CC9 |
| 6 | MA201 | Engineering Mathematics-III | 3 | 1 | 0 | 4 | GE7 |
| 7 | CI281 | Internet Technology Lab | 0 | 0 | 3 | 2 | CC-L4 |
| 8 | CI283 | Data Structure & Algorithms Lab | 0 | 0 | 3 | 2 | CC-L5 / SEC |
| 9 | CI285 | Sensors and Devices Lab | 0 | 0 | 3 | 2 | CC-L6 / SEC |
| 10 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 18 | 1 | 9 | 25 | |

SEMESTER IV

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|--------------------------------|------------|----------|----------|-----------|-------------|
| 1 | CI202 | Software Engineering | 3 | 0 | 0 | 3 | CC10 |
| 2 | CI204 | Database Management System | 3 | 0 | 0 | 3 | CC11 / SEC |
| 3 | CI206 | Java Programming | 3 | 0 | 0 | 3 | CC12 |
| 4 | CI208 | Artificial Intelligence | 3 | 0 | 0 | 3 | CC13 |
| 5 | CI210 | Theory of Automata | 3 | 1 | 0 | 4 | CC14 |
| 6 | CI212 | Computer Networks | 3 | 0 | 0 | 3 | CC15 / SEC |
| 7 | CI282 | Database Management System Lab | 0 | 0 | 3 | 2 | CC-L7 / SEC |
| 8 | CI284 | Java Programming Lab | 0 | 0 | 3 | 2 | CC-L8 / SEC |
| 9 | CI286 | Computer Networks Lab | 0 | 0 | 3 | 2 | CC-L9 / SEC |
| 10 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 18 | 1 | 9 | 25 | |

SEMESTER V

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|---------------------------------------|------------|----------|----------|-----------|--------------|
| 1 | CI301 | Compiler Design | 3 | 1 | 0 | 4 | CC16 / AECC |
| 2 | CI303 | Soft Computing Techniques | 3 | 0 | 0 | 3 | CC17 |
| 3 | CI305 | Analysis and Design of Algorithms | 3 | 0 | 0 | 3 | CC18 |
| 4 | CI307 | Cloud Computing | 3 | 0 | 0 | 3 | CC19 |
| 5 | CI309 | Machine Learning | 3 | 0 | 0 | 3 | CC20 / SEC |
| 6 | | Elective 1 | 3 | 0 | 0 | 3 | E1 / DSE |
| 7 | CI381 | Analysis and Design of Algorithms Lab | 0 | 0 | 3 | 2 | CC-L10/ SEC |
| 8 | CI383 | Cloud Computing Lab | 0 | 0 | 3 | 2 | CC-L11 / SEC |
| 9 | CI385 | Machine Learning Lab using Python | 0 | 0 | 3 | 2 | CC-L12 / SEC |
| 10 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 18 | 1 | 9 | 25 | |

SEMESTER VI

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|--|------------|----------|----------|-----------|------------|
| 1 | CI302 | Web Development using PHP | 3 | 0 | 0 | 3 | CC21 |
| 2 | CI304 | Network Technologies in IoT and its Applications | 3 | 0 | 0 | 3 | CC22 |
| 3 | CI306 | Ad hoc & Sensor Networks | 3 | 1 | 0 | 4 | CC23 |
| 4 | CI308 | IoT Architecture, Protocols and Programming | 3 | 0 | 0 | 3 | CC24 |
| 5 | CI310 | Big Data Analytics | 3 | 0 | 0 | 3 | CC25 / SEC |
| 6 | | Elective 2 | 3 | 0 | 0 | 3 | E2 / DSE |
| 7 | CI382 | Web Development using PHP Lab | 0 | 0 | 3 | 2 | CC-L13 |
| 8 | CI384 | IoT Programming Lab | 0 | 0 | 3 | 2 | CC-L14 |
| 9 | CI386 | Big Data Analytics Lab | 0 | 0 | 3 | 2 | CC-L15 |
| 10 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 18 | 1 | 9 | 25 | |

Industrial Training will be done by candidate individually after third year during the summer break and it will be of minimum 4 weeks. It will be evaluated as per University Examination in VII semester.

SEMESTER VII

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|-------------------------------------|------------|----------|-----------|-----------|------------|
| 1 | MA401 | Modeling & Simulation | 3 | 1 | 0 | 4 | GE8 |
| 2 | CI401 | Cloud Based IoT | 3 | 0 | 0 | 3 | CC26 |
| 3 | CI403 | Open Source Programming for IoT | 2 | 0 | 0 | 2 | CC27 / SEC |
| 4 | | Elective 3 | 3 | 0 | 0 | 3 | E3 / DSE |
| 5 | | Elective 4 | 3 | 0 | 0 | 3 | E4 / DSE |
| 6 | CI481 | Open Source Programming for IoT Lab | 0 | 0 | 3 | 2 | CC-L16 |
| 7 | CI491 | Minor Project | 0 | 0 | 10 | 5 | MP1 / E |
| 8 | CI493 | Industrial Training | 0 | 0 | 6 | 3 | IT1 / E |
| 9 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 14 | 1 | 19 | 25 | |

SEMESTER VIII

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|--------------------------------|-------------|---------------------|------------|----------|-----------|-----------|---------|
| 1 | CI490 | Seminar | 0 | 0 | 3 | 2 | S / E |
| 2 | CI492 | Major Project | 0 | 0 | 16 | 8 | MP2 / E |
| 3 | CI494 | Internship | 0 | 0 | 30 | 15 | I / E |
| 4 | GP | General Proficiency | Non Credit | | | | |
| Total Hours and Credits | | | 0 | 0 | 49 | 25 | |

GRAND TOTAL OF CREDITS = 200

In the **Seminar**, student need to study and present individually, on latest research paper of their specialized area and It will be evaluated as per University Examination Rules.

The **Internship** in Industry will be done by candidate individually during the 8th semester and it will be for a minimum of 4 (-6) months. It will be evaluated as per University Examination Rules.

Minor and Major Project will be in a group and It will be evaluated as per University Examination Rules.

USICT will provide a mentor/supervisor for industrial training, seminar, internship, minor and major projects.

ELECTIVES FROM DCSE

| S.No. | Course Code | Course Name | L | T | P | Credits | Types |
|-------|-------------|---|---|---|---|---------|-------|
| 1 | CI311 | Network Defense for Cyber Security | 3 | 0 | 0 | 3 | E1 |
| 2 | CI313 | Energy Management in IoT Devices | 3 | 0 | 0 | 3 | E1 |
| 3 | CI315 | Multimedia and IoT Technology | 3 | 0 | 0 | 3 | E1 |
| 4 | CI317 | Advanced Sensor Technologies | 3 | 0 | 0 | 3 | E1 |
| 5 | CI319 | Embdded Systems | 3 | 0 | 0 | 3 | E1 |
| 6 | CI312 | Network Modeling | 3 | 0 | 0 | 3 | E2 |
| 7 | CI314 | Cloud Architecture and Security | 3 | 0 | 0 | 3 | E2 |
| 8 | CI316 | Network Management | 3 | 0 | 0 | 3 | E2 |
| 9 | CI318 | Distributed Computing Systems | 3 | 0 | 0 | 3 | E2 |
| 10 | CI320 | Software Defined Networks | 3 | 0 | 0 | 3 | E2 |
| 11 | CI405 | Information Security and Privacy in IoT | 3 | 0 | 0 | 3 | E3 |
| 12 | CI407 | SDN and NFV for IOT | 3 | 0 | 0 | 3 | E3 |
| 13 | CI409 | SAS Analytics | 3 | 0 | 0 | 3 | E3 |
| 14 | CI411 | Mobile and Wireless Network Security | 3 | 0 | 0 | 3 | E3 |
| 15 | CI413 | Cryptography and Network Security | 3 | 0 | 0 | 3 | E3 |
| 16 | CI415 | Network Simulators | 3 | 0 | 0 | 3 | E4 |
| 17 | CI417 | Android Security Design and Internals | 3 | 0 | 0 | 3 | E4 |
| 18 | CI419 | Business Process Management Cognitive IoT | 3 | 0 | 0 | 3 | E4 |
| 19 | CI421 | IoT in Health Care | 3 | 0 | 0 | 3 | E4 |
| 20 | CI423 | Industrial IoT | 3 | 0 | 0 | 3 | E4 |

CI Computer Science & Engineering / Internet of Things for Course Code

CC Core Course from USICT for Type of Course

GE General Elective from related discipline of other Deptt./School

GE L General Elective Lab from related discipline of other Deptt./School

OE Open Elective from other discipline of other Deptt./School

AECC Ability Enhancement Compulsory Course

DSE Discipline Specific Course

SEC Skill Enhancement Course

E Elective from USICT

CC-L Core Course Lab from USICT

IT1 Industrial Training

MP Minor / Major Project

S Seminar

I Internship

SEM-I

| FUNDAMENTALS OF COMPUTER PROGRAMMING | | | |
|---|----------------|---------------------------------|-----------|
| Course Code: | CS103 | Course Credits: | 4 |
| Course Category: | CC | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Lectures + Tutorials (Hrs/Week): | 03 + 01 | Mid Sem. Exam Hours: | 1 |
| Total No. of Lectures (L + T): | 45 + 15 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1. To provide knowledge of primary and derived datatypes used in C | | | |
| 2. To make them understand basic conditional and break statements used in C | | | |
| 3. To provide a basic understanding of pointers and pointers arithmetic | | | |
| 4. To enable the students to explore how pre-defined functions are used and also created in a program | | | |
| 5. Learn difference between static and dynamic memory allocation method and also learn various dynamic memory allocation methods. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1. Understand the basic building blocks of C language like tokens, identifiers, constants and variables. | | | |
| 2. Acquire knowledge of various conditional and loop statements | | | |
| 3. Judge which data structure to use among arrays, struct and union depending on the application | | | |
| 4. Use pointers and tell the difference between call by value and call by reference. | | | |
| 5. Use dynamic memory allocation to create arrays, structures and union and also perform various operations on them. | | | |

UNIT I INTRODUCTION TO COMPUTER AND PROGRAMMING CONCEPTS

Definition, characteristic, generation of computers, basic components of a computer system, memory, input, output and storage units, high level language and low level language, Soft- ware: system software, application software, hardware, firmware, Operating System, compiler, interpreter and assembler, linker, loader, debugger, IDE. Introduction to algorithm and flow chart; representation of algorithm using flow chart symbol, pseudo code, basic algorithm design, characteristics of good algorithm, development of algorithm.

UNIT II INTRODUCTION TO C PROGRAMMING LANGUAGE

Introduction to C programming language , Declaring variables, preprocessor statements, arithmetic operators, programming style, keyboard input , relational operators, introduction, feature of C language, concepts, uses, basic program structure, simple data types, variables, constants, operators, comments, control flow statement :if, while, for, do-while, switch.

UNIT III DATA TYPES AND STRUCTURES

bitwise operators, Pre defined and User defined data types, arrays, declaration and operations on arrays, searching and sorting on arrays, types of sorting, 2D arrays, Passing 2D arrays to functions, structure, member

accessing, structure and union, array of structures, functions, declaration and use of functions, parameter passing, recursion .

UNIT IV FUNDAMENTALS OF POINTERS

Introduction to pointers, pointer notations in C, Declaration and usages of pointers, operations that can be performed on computers, use of pointers in programming exercises, parameter passing in pointers, call by value, call by references, array and characters using pointers, dynamic memory allocation

UNIT V FILE HANDLING IN C AND ENUM

Introduction to file handling, file operations in C , defining and opening in file, reading a file, closing a file, input output operations on file, counting: characters, tabs , spaces, file opening modes, error handling in input/output operations, Enumerated data types, use of Enum, declaration of Enum.

Text Books:

1. C Programming by Herbert Shield
2. C Programming Language 2nd Edition by Brian, W Kernighan Pearson Education.
3. Programming in ANSI C by E. Balagurusamy, Tata Mgraw Hill
4. C Puzzle Book: Puzzles For The C. Programming Language by Alan R Feuer Prentice HallGale
5. Expert C Programming: Deep C Secrets (s) by Peter Van Der Linden Dorling Kindersley India.

| INTERNET OF THINGS | | | |
|--|-----------------|---------------------------------|-----------|
| Course Code: | CI103 | Course Credits: | 2 |
| Course Category: | CC | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 1U |
| No. of Lectures + Tutorials+Practical (Hrs/Week): | 2+0+0 | Mid Sem. Exam Hours: | 1 |
| Total No. of Lectures (L + T): | 30 +0+00 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1 Students will be explored to the interconnection and integration of the physical world in IoT. | | | |
| 2 Learning of networking concepts in IoT environment. | | | |
| 3 Understanding of various wireless network, topologies, IoT protocols. | | | |
| 4 Understanding of the importance of security issues in IoT. | | | |
| 5 implementation of IoT in real life. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1 understand about all concepts of Internet of Things. | | | |
| 2 understand building blocks of Internet of Things and its characteristics. | | | |
| 3 learn application protocols for IoT. | | | |
| 4 Able to understand the application areas of IoT. | | | |
| 5 Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks. | | | |

Unit I Basics of IoT

Introduction to computer networks, evolution of computer networks and its uses, Wireless sensor network, TCP/IP protocol stack, Internet of Things, Purpose of IoT, Building Blocks of IoT, Elements of an IoT ecosystem.

Unit II IoT Protocols

Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols: IEEE802.15.4, BACNet Protocol, Modbus, KNX, Zigbee, Network layer, APS layer, Security

Unit III IoT Architecture

IoT Open source architecture (OIC), OIC Architecture & Design principles, IoT Devices and deployment models, IoTivity: An Open source IoT stack, Overview- IoTivity stack architecture- Resource model and Abstraction

Unit IV Web of Things

Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.

Unit V IoT Applications

IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, and Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.

Text Books

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key Applications and Protocols", Wiley, 2012.

Reference Books

1. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. Cuno Pfister, "Getting Started with the Internet of Things", O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1

| COMPUTER PROGRAMMING LAB | | | |
|--|--------------|---------------------------------|-----------|
| Course Code: | CS181 | Course Credits: | 1 |
| Course Category: | CC-P | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Labs (Hrs/Week): | 02 | Mid Sem. Exam Hours: | |
| Total No. of Labs : | 10 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1. To introduce students to the basic knowledge of programming fundamentals of C language. | | | |
| 2. To impart writing skill of C programming to the students and solving problems. | | | |
| 3. To impart the concepts like looping, array, functions, pointers, file, structure. | | | |
| 4. Write programs to print output on the screen as well as in the files.. | | | |
| 5. Apply all the concepts that have been covered in the theory course. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1. Recognize and understand the syntax and construction of C programming code | | | |
| 2. Able to design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage. | | | |
| 3. Able to define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures. | | | |
| 4. Student must be able to define union and enumeration user defined data types. | | | |
| 1. Develop confidence for self-education and ability for life-long learning needed for Computer language. | | | |
| 5. | | | |

LIST OF EXPERIMENTS:

1. Write a program for the following:
 - a) To find the reverse of a given number.
 - b) Calculate factorial of a number using recursion.
2. Write a program to take marks of a student of 5 subjects as an input and print the grade. Also create the same program using switch.

marks < 40 = FAIL

marks >= 40 and <= 59 = GOOD

marks >= 59 and < 80 = EXCELLENT

marks >= 80 = OUTSTANDING

3. Write a program to compute the length of a string using While Loop.
4. Write a program to print the following pattern: -

- a) *
 - **
 - ***
 - ****

b) *

* *

* * *

* * * *

c) 0

1 2

3 4 5

6 7 8 9

5. Write a program to compute and display the product of two matrices.
6. Write a program to illustrate the difference between call by value and call by reference.
7. Write a program to check whether a given string is palindrome or not.
8. Create a structure called STUDENT having name, reg no., class as its field.
Compute the size of structure STUDENT.
9. Write a program to compute the length of a string using pointers.
10. Write a program to create a file, input data and display its content.

SEM-II

| Introduction to PYTHON | | | |
|--|----------------|---------------------------------|-----------|
| Course Code: | CI102 | Course Credits: | 2 |
| Course Category: | CC | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Lectures + Tutorials (Hrs/Week): | 02 +0+0 | Mid Sem. Exam Hours: | 1 |
| Total No. of Lectures (L + T): | 30 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1. Master the fundamentals of writing Python scripts. | | | |
| 2. Learn core Python scripting elements such as variables and flow control structures. | | | |
| 3. Discover how to work with lists and sequence data. | | | |
| 4. Write Python functions to facilitate code reuse. | | | |
| 5. Use Python to read and write files. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1. Problem solving and programming capability. | | | |
| 2. Explain basic principles of Python programming language | | | |
| 3. Implement database and GUI applications. | | | |
| 4. Implement object oriented concepts | | | |
| 5. Define and demonstrate the use of built-in data structures “lists” and “dictionary” | | | |

UNIT I PYTHON BASICS, CONDITIONAL & LOOPS

Installation of Python and python Notebook, Python Objects, Number & Booleans, Strings, Operators - Arithmetic, Bitwise, comparison and Assignment operators, Operators Precedence and associativity. Conditions (If else, if-elif-else), Loops (While ,for), Break and Continue statements, Range Functions

UNIT II STRING OBJECTS AND LIST OBJECTS

String object basics, String methods, Splitting and Joining Strings, String format functions, list object basics, list methods, List comprehensions.

UNIT III TUPLES, SET, DICTIONARIES & FUNCTIONS

Tuples, Sets, Dictionary Object basics, Dictionary Object methods, Dictionary View Objects. Functions basics, Parameter passing, Iterators

UNIT IV OOPS CONCEPTS & WORKING WITH FILES

OOPS basic concepts, creating classes and Objects, Inheritance, Multiple Inheritance, working with files, Reading and writing files, Buffered read and write, Other File methods

UNIT V MODULES, EXCEPTION HANDLING & DATABASE PROGRAMMING

Using Standard Module, Creating new modules, Exceptions Handling with Try-except, Creating, inserting and retrieving Table, Updating and deleting the data.

Text Books:

1. Head First Python 2e: A Brain-Friendly Guide Paperback – Illustrated, 16 by Paul Barry, Oreilly
2. Python: The Complete Reference Paperback – 20 March 2018 by Martin C. Brown (Author), TMH Publication
3. Let Us Python by Yashavant Kanetkar , 1 January 2019, BPB publication
4. Python Programming, A modular approach , First Edition, By Pearson Publication by Taneja Sheetal and Kumar Naveen , 26 September 2017

| COMPUTER ORGANIZATION AND ARCHITECTURE | | | |
|---|----------------|---------------------------------|-----------|
| Course Code: | CI104 | Course Credits: | 3 |
| Course Category: | CC | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Lectures + Tutorials (Hrs/Week): | 03 + 00 | Mid Sem. Exam Hours: | 1 |
| Total No. of Lectures (L + T): | 45 + 00 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1. Discuss the basic concepts and structure of computers. | | | |
| 2. Understand concepts of register transfer logic and arithmetic operations. | | | |
| 3. Explain different types of addressing modes and memory organization. | | | |
| 4. Learn the different types of serial communication techniques. | | | |
| 5. Summarize the Instruction execution stages. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. | | | |
| 2. Understand the theory and architecture of central processing unit | | | |
| 3. Analyze some of the design issues in terms of speed, technology, cost, performance. | | | |
| 4. Use appropriate tools to design verify and test the CPU architecture | | | |
| 5. Learn the concepts of parallel processing, pipelining and interprocessor communication. | | | |

UNIT I COMPUTER ARITHMETIC AND NUMBER SYSTEM

Functional units of digital system and their interconnections, Logic gates, Boolean algebra, combinational circuits, flip flops, sequential circuits, Number representation; number system, fixed and floating point number representation, arithmetic algorithms (addition, subtraction, booth multiplication).

UNIT II REGISTER TRANSFER AND MICROOPERATION

Register transfer language, bus and memory transfers, bus architecture, bus arbitration, arithmetic logic, shift micro operation, arithmetic logic shift unit, design of fast address.

UNIT III PROCESSOR DESIGN

Processor organization: general register organization, stack organization, addressing mode, instruction format, data transfer & manipulations, program control, reduced instruction set computer.

UNIT IV INPUT-OUTPUT ORGANIZATION

I/O interface, synchronous and asynchronous data transfer, strobe, handshaking schemes, modes of transfer, interrupts & interrupt handling, direct memory access, I/O channels ,input-output processor.

UNIT V MEMORY ORGANIZATION

Memory hierarchy, main memory (RAM and ROM Chips), organization of 2d and 2 1/2 d, auxiliary memory, Cache memories: concept and design issues & performance, address mapping and replacement, virtual memory, memory management hardware.

Text Books:

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. William Stalling, “ Computer Organization”, PHI
3. Vravice, Hamacher & Zaky, “Computer Organization”, TMH
4. Mano, ” Computer System Architecture”, PHI
5. John P Hays, “ Computer Organization”, McGraw Hill
6. Tannenbaum, ” Structured Computer Organization’, PHI
7. P Pal chaudhry, ‘ Computer Organization & Design’, PHI

| PYTHON PROGRAMMING LAB | | | |
|--|--------|--------------------------|----|
| Course Code: | CI182 | Course Credits: | 1 |
| Course Category: | CC-P | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Labs (Hrs/Week): | 2 hrs) | Mid Sem. Exam Hours: | 1 |
| Total No. of Labs: | 10 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 1. To introduce students to use of Python programming to solve data analytics problems | | | |
| 2. To elaborate students to statistical analysis using Python programming | | | |
| 3. To describe various libraries required for data analytics | | | |
| 4. To elaborate statistical analysis using Python | | | |
| 5. To study special libraries in Python such as Numpy and Scipy | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 1. Improve problem solving and programming capability | | | |
| 2. Learn data analytics through python programming | | | |
| 3. Underline the use of package | | | |
| 4. Write simple Python programs for solving problems. | | | |
| 5. Decompose a Python program into functions, lists etc. | | | |

List of Experiments:

Write a program in python :

- To print the largest/smallest of two numbers
- To read two numbers x and n and print x^n (first write with the use of operator and then write with the help of inbuilt function)
- To input the value of x and n and print the sum of the series:
 - $1+x+x^2+x^3+x^4+\dots+x^n$
- Write a program to compute distance between two points taking input from the user (Pythagorean Theorem)
- Write a program to count the numbers of characters in the string and store them in a dictionary data structure
- To print factorial of a number with and without using recursion
- To tell the frequency of the most common word in a file or a given string
- Write a function to find all duplicates in the list.
- Write a program to perform addition and multiplication of two square matrices
- To read from a text file and print each word separated by # symbol, example #xyz #xyz

| COMPUTER ORGANIZATION AND ARCHITECTURE LAB | | | |
|---|--------------|---------------------------------|-----------|
| Course Code: | CI183 | Course Credits: | 1 |
| Course Category: | CC-P | Course (U / P) | U |
| Course Year (U / P): | 1U | Course Semester (U / P): | 2U |
| No. of Labs (Hrs/Week): | 2 hrs | Mid Sem. Exam Hours: | 1 |
| Total No. of Labs: | 10 | End Sem. Exam Hours: | 3 |
| COURSE OBJECTIVES | | | |
| 6. Discuss the basic concepts and structure of computers. | | | |
| 7. Understand concepts of register transfer logic and arithmetic operations. | | | |
| 8. Explain different types of addressing modes and memory organization. | | | |
| 9. Learn the different types of serial communication techniques. | | | |
| 10. Summarize the Instruction execution stages. | | | |
| COURSE OUTCOMES | | | |
| At the end of the course the students should be able to: | | | |
| 6. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation. | | | |
| 7. Understand the theory and architecture of central processing unit | | | |
| 8. Analyze some of the design issues in terms of speed, technology, cost, performance. | | | |
| 9. Use appropriate tools to design verify and test the CPU architecture | | | |
| 10. Learn the concepts of parallel processing, pipelining and interprocessor communication. | | | |

List of Experiments:

1. Experiments / Spice Simulations
2. Bread Board Implementation of Logic Gates and Universal gates.
3. Bread Board Implementation of Flip-Flops.
4. Experiments with clocked Flip-Flop.
5. Design of Counters.
6. Bread Board implementation of counters & shift registers.
7. Implementation of Arithmetic algorithms.
8. Bread Board implementation of Adder/Subtractor (Half, Full)
9. Bread Board implementation of Binary Adder.
10. Design a multiplex display unit using counter, multiplexer and decoder.
11. Bread Board implementation of Seven Segment Display.
12. Programming in Assembly Language.12x2T
13. Use a multiplexer unit to design a composite ALU.
14. Test a RAM chip and cascade two chips for vertical and horizontal expansion. Use wired OR tri-state output
15. Use ALU chip for multibit arithmetic operation.