STATE BOARD OF TECHNICAL EDUCATION BIHAR

Scheme of Teaching and Examinations for

IIIrd SEMESTER DIPLOMA IN ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING

(Effective from Session 2022-23 Batch)

THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment (TA) Marks A	Class Test (CT) Marks B	End Semester Exam (ESE) Marks C	Total Marks (A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Discrete Mathematics	2018301	03	03	10	20	70	100	28	40	02
2.	Digital System and Computer Organization	2044302	03	03	10	20	70	100	28	40	03
3.	Data Structures and Algorithms using C	2044303	03	03	10	20	70	100	28	40	03
4	Microprocessors and Microcontrollers	2044304	04	03	10	20	70	100	28	40	04
5.	Data base management system	2044305	03	03	10	20	70	100	28	40	03
		Total :-	16				350	500			15

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME					
			Periods per Week	Hours of Exam.	Practical		Total Marks (PA+ESE)	Pass Marks	Credits
					Internal (PA)	External (ESE)			
6.	Digital System and Computer Organization LAB	2044306	04	03	15	35	50	20	02
7.	Data base management system LAB	2044307	04	03	15	35	50	20	02
8	Data Structure using C LAB	2044308	04	03	15	35	50	20	02
	Total :-	12					150		06

TERM WORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner (PA)	Marks of External Examiner (ESE)	Total Marks (PA+ESE)	Pass Marks in the Subject	Credits
9.	Digital System and Computer Organization (TW)	2044309	2	15	35	50	20	01
10	Course Under Moocs/ NPTEL / Others	2044310	2	07	18	25	10	01
11.	PYTHON	2018311	2	07	18	25	10	01
	Total:-6					100		03
Total Periods per week Each of duration One Hour		34		Total Marks = 750				24

DISCRETE MATHEMATHICS

SUBJECT CODE: 2018301	Theory			No. of period in one session: 50			Credits
	No. of Periods per Week			Full Marks:	:	100	02
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	10	
				C.T	:	20	

Course Learning Objective:

The main objectives of the course are to:

- Introduce concepts of mathematical logic for analysing propositions and proving theorems.
- Use sets for solving applied problems, and use the properties of set operations algebraically.
- Work with relations and investigate their properties.
- Investigate functions as relations and their properties.
- Introduce basic concepts of graphs, digraphs and trees.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Analyse logical propositions via truth tables.
- Prove mathematical theorems using mathematical induction.
- Understand sets and perform operations and algebra on sets.
- Determine properties of relations, identify equivalence and partial order relations, sketch relations.
- Identify functions and determine their properties.
- Define graphs, digraphs and trees, and identify their main properties.
- Evaluate combinations and permutations on sets.

Contents: Theory		Hrs.
Unit – 1	**The Foundations- Logic and Proofs:** Propositional logic, propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Interference, Introduction to proofs, Normal forms, proof methods and strategy.	[9]
Unit – 2	**Introduction to SET THEORY:** Concept of sets: Notation – subset, superset, Empty set, Universal set. Examples – Operation on sets: Union – Intersection – Complementation – Difference – Symmetric difference – problems relating simple set identities, Definition of power set, Cartesian product of finite number of sets, simple problems – cardinality of a set, Finite and Infinite sets.	[8]
Unit – 3	**Relation Between two sets:** Binary relation as a subset of Cartesian product, Reflexive, Symmetric & transitive relations – Examples, Equivalence relation – Examples.	[6]
Unit – 4	**Functions:** Definition of function – Domain, Co-domain & Range of a function – Related problems.	[6]

Unit – 5	**Recurrence Relation:** Definition – Examples (Fibonacci, Factorial etc.), Linear recurrence relations with constants coefficients – Homogenous solutions – Particular solutions – Total solutions – Problems.	[6]
Unit – 6	**Graph Theory:** Introduction – Definition of a graph – sub graph – Isomorphism-walk, Paths and circuits – connectedness and components – Euler graphs.	[5]
Unit – 7	**Counting:** Introduction – Basic counting principles, Factorial Notation, Binomial coefficients, Permutations, Combinations, The pigeonhole principle, Generation of Permutation and Combinations.	[5]
Unit – 8	**Probability Theory:** Introduction, Sample space and Events, Finite probability spaces, Conditional probability, Independent Events, Independent Repeated Trials, Binomial Distribution, Random variables.	[5]

Text/Reference Books-

1. Foundation of Discrete Mathematics – K.D. Joshi
2. Discrete Mathematics with Algorithms – Albertson & Hutchinson / John Wiley
3. Discrete Mathematics / Iyengar, Venkatesh, Chandrasekaran & Arunachalam / Vikash Publishing House
4. Discrete Structure and Graph Theory / S.K.S. Rathore and H. Chaudhuri / Everest Publishing House
5. Discrete Mathematics & Its Applications with combinatorics and Graph Theory, Seventh Edition – Kenneth H Rosen / Tata McGraw-Hill Education Pvt. Ltd New Delhi
6. Discrete Mathematics, Third Edition – Seymour Lipschutz, Marc Lars Lipson, Varsha H Patil / Tata McGraw-Hill Education Pvt. Ltd New Delhi

DIGITAL SYSTEM AND COMPUTER ORGANIZATION

SUBJECT CODE:	Theory			No. of period in one session: 42			Credits
	No. of Periods per Week			Full Marks:	:	100	
2044302	L	T	P/S	ESE	:	70	03
	03	-	-	T. A	:	10	
				C.T	:	20	

Course Objective:

The subject will help the students to learn facts, concepts, principle and procedure of digital electronics and computer basic components. Furtherthe course will help them to learn as to how the basic components interact with each other to form a working system and the role of digital electronics in it.

Course outcomes: After completion of course, students would be able to:

1. Understand the hardware and software design including logic design, and basic structure and behavior of the various functional modules of the computers and digital systems.
2. Understand the hardware and software interact to provide the processing needs of the user.
3. To know basic concepts of digital electronics and familiarity with available chips.
4. Understand the Building blocks of the computer.
5. Understand the assembly Language Programming.

CONTENTS: THEORY

Unit	Name of Topics	Hrs/week
Unit-I	**Basic structure of computers and number system:** Structure of a computer system, Arithmetic Logic Unit, Control Unit,Bus Structure, Von Neumann Architecture, Decimal, binary, octal and hexadecimal, hexa-decimal number systems, Conversion from one system to another,1's and 2's complements.	**08**
Unit-II	Introduction to logic gates, Boolean algebra, De Morgan's Theorems; Karnaugh-Map ,Sum of Product, Product of Sum, Min term , Max term, Logical diagram, truth table, Flip -Flops- RS, T, D, JK, Master/ Slave JK.	**08**
Unit-III	**Computer Arithmetic Operations:** ➢ Adders: • Half Adder • Full Adder ➢ Sub tractors: • Half sub tractor • Full sub tractor ➢ Addition and Subtraction Algorithm: Addition and Subtraction with Signed MagnitudeData ➢ Multiplication Algorithms: • Hardware Implementation for multiplication. • Flowchart for Multiplying Binary Numbers. Booth's Multiplication Algorithm.	**10**
Unit-IV	**Central Processing Unit and Instruction:** ➢ Micro operations:	**10**

	• Arithmetic micro-operations • Logic micro-operations • Shift micro-operations ➢ Control Unit: • Performing an Arithmetic or Logic operation. • Fetching a word from memory, storing a word ina memory, Execution of a complete Instruction. • Hardwired Control Unit. • Micro programmed Control Unit. ➢ Components of CPU: • Buses • Registers • Flags • Stacks • I/O Ports General Register Organization, Types of Instructions, Instruction formats, Addressing modes, Data transfer and manipulation, Program control, Instruction cycle.	
Unit-V	**Memory and I/O Organization:** Characteristics of Memory system, Types of memories, Mainmemory, Static & Dynamic memories, Secondary memory, Cache memory, Virtual memory, Peripheral Devices, Input-output Interface, Interrupt Handling, Types of Interrupts, Direct Memory Access, Input-output Processor (IOP), Synchronous and Asynchronous Data Transfer.	**6**

Text/Reference Books:

1 Computer System Architecture, Third Edition, 2000, Pearson Education, M.M. Mano

2 Computer System and Architecture, Prentice Hall of India Pvt. Ltd., New M. Mano Delhi

3 Computer Architecture and Organization, McGraw Hill Company, New Delhi, J.P. Hayes

4 Computer Organization and Architecture, Prentice Hall of India Ltd., NewW. Stallings Delhi

5 Computer System Architecture, Third Edition, 1998, Prentice Hall of India, M. Morris Mano

6 Digital Logic and Computer Design, Prentice Hall of India Ltd., New Delhi. - Morries Marrow

DATA STRUCTURE & ALGORITHMS USING "C"

SUBJECT CODE: 2044303	Theory			No. of period in one session: 42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	10	
				C.T	:	20	

Course Learning Objective:

Data Structure is a subject which deals with data and their structures. In system programming, application programming, the method and techniques of data structures are widely used. This study of data structure helps the students in developing logic & structured programs.

Course outcomes: After completion of this course student will be able to: -

1. Understand and use the process of abstraction using a programming language such as 'C'.
2. Analyze step by step and develop algorithm to solve real world problems.
3. Implementing various data structures viz. Stacks, Queues, Linked Lists,Trees and Graphs
4. Understanding various searching & sorting techniques.

CONTENTS: THEORY

Unit	Name of Topics	Hrs/week
Unit-I	**Introduction to Data Structure: -** Data & Information, Concept and Need of DS, Abstract Data Type.Types of Data Structure: Linear & Non-linear. Algorithm Complexity: Time & Space. Operation on Data Structure:	**08**
Unit-II	**Searching & Sorting: -** Searching: Implementation of Different searching algorithm.Sorting: Implementation of Different Sorting algorithm.	**06**
Unit-III	**Stacks & Queues: -** Stack: Introduction to Stack: Stack Operation Conditions: Application of Stack: Infix- to-Postfix Transformation Evaluation Postfix. Introduction to Queue, Dequeue: Array Representation of Queue; Operation on Queue: Types of Queues: Linear Queue Circular Queue, Priority Queue, Application of Queue.	**08**
Unit-IV	**Linked List: -** Introduction to Linked List Terminology: Node, Address,Pointer, Data field and Next Pointer, Empty List. Types of Lists: Singly Linked List, Doubly Link list, CircularLinked List. Operation on Linked List.	**08**
Unit-V	**Trees and Graphs: -** Introduction to Trees: Basic Terminology: Tree, Degree of a Node and Tree, Level of Node, Leaf Node, Depth & Height of a Tree;Type of Tree. Introduction to Binary Tree (BT): Operation on BT: Insertion, Deletion, Searching, and traversing the Tree (Pre-order, Post order, In order); Application of BT. Introduction to Binary Search Tree (BST): Operation on BT: Insertion, Deletion, Finding Min-Max Element, Sorting Element; Introduction to AVL Tree: Insertion, Deletion; Intrusions to Graph basic terminology:Adjacency List, Adjacency Matrix.	**12**

Reference Books:

1. Data Structure Using C and C++, Second Addition, 2000, Y. Langsam, M. **J.** Augustein and A. M. Tanebaum Prentice Hall of India.
2. Data Structure Using C and C++, Second Addition, 2000, R. Kruse, C. L. Tonodo and B. Leung Prentice Hall of India.
3. Data Structure through "C" Language, First Edition, 2001, S.Chottopadhyay, D. Ghoshdastidar & M.Chottopadhyay BPB Publication
4. Data Structures, Algorithms and Object Oriented, G. L. Heileman
5. Programming, First Edition, 2002, Tata McGraw Hill
6. Fundamental of Data Structures in C++, 2002, Galgotia E. Horowitz, Salmi and D. Mehta Publication 2002

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: 2044304	Theory			No. of period in one session: 56			Credits
	No. of Periods Per Week			Full Marks	:	100	04
	L	T	P/S	ESE	:	70	
	04	-	-	TA	:	10	
	-	-	-	CT	:	20	

Course Objectives:

The aim of this course is to help the students to attain the following industry identified competencythrough various teaching learning experiences:

- **Maintain microcontroller based systems.**

Course outcomes: After completion of this course student will be able to: -

1. Analyze architecture of microprocessor 8085
2. Analyze architecture of microcontroller ICs.
3. Interpret the program of 8051 in assembly language for the given operations.
4. Interpret the program by using timer interrupt and serial ports parallel ports.
5. Interface the memory and IO devices to 8051 microcontroller
6. Maintain microcontroller used in different application

CONTENTS: THEORY

Chapter	Name of the Topic	Hours	Marks
Unit-01	Microprocessor 8085 1.1 Evolution of microprocessors 1.2 Architecture of 8085 1.3 Pin diagram 1.4 Control signals 1.5 Multiplexing of address & DataBus	07	10
Unit-02	8085 Assembly Language Programming 2.1 Programming Model of 8085 2.2 Addressing Modes 2.3 Instruction classification, Instruction format 2.4 Instruction set 2.5 Stacks & subroutines 2.6 Assembly Language programming	08	12
Unit-03	Microcontroller Basics 3.1 Introduction and applications 3.2 Comparison between microcontrollers and microprocessors 3.3 Evolution of microcontrollers 3.4 Commercial microcontroller devices (some important Ics & brief idea)	07	04
Unit-04	8051 Architecture 4.1 Block diagram of 8051 microcontroller 4.2 Registers in 8051 4.3 General purpose or working registers 4.4 Stack Pointer and Program counter 4.5 Special function registers (SFR)	07	08
Unit-05	8051 connections, I/O ports and memory organization 5.1 8051 pin description 5.2 8051 connections 5.3 Parallel I/O ports 5.4 Memory organization	07	08
Unit-06	8051 addressing modes and instructions 6.1 8051 addressing modes 6.2 8051 instruction set	05	08

Unit-07	8051 interrupts, timer/counters and serial communication 7.1 Interrupts in 8051 7.2 Initializing 8051 interrupts & theirpriorities 7.3 Timers andcounters, timer counter modes 7.4 Serial communication, serial communication modes	07	08
Unit-08	Applications 8.1 Square wave and rectangular wave generation 8.2 Pulse generation 8.3 Pulse width modulation 8.4 Frequency counter 8.5 Interfacing small keyboards 8.6 Interfacing LCD display, 8.7 Interfacing D/A and A/D converters 8.8 Interfacing relay 8.9 Interfacing stepper motor 8.10 Interfacing DC motor.	**12**	**10**
	Total :-	**42**	**70**

Reference Books:

1. The 8051 Micro Controllerand Em-bedded Systems, Muhammad Ali Mazidi & JaniceGilli Mazidi, R.D.Kinely, PHI Pearson Education,5th Indianre print
2. Microprocessor and Microcontrollers, Krishna Kant, Eastern Company Edition, Prentice Hall ofIndia, New Delhi
3. Microprocessor & MicrocontrollerArchitecture: Programming & Interfacing using 8085,8086,8051, Soumitra Kumar Mandal, McGraw Hill Edu
4. Microcontrollers: Architecture implementation and Programming, Tabak Daniel, Hintz Kenneth j, Tata McGraw Hill,2007
5. ARM Developer's Guide.UM10139 LPC214X User manual – Rev.4, Andrew N.Sloss, Dominic Symes, Chris Wright
6. Microprocessors and interfacing: programming and hardware, Douglas V. Hall Tata McGraw Hill, 2nd editon, 2007
7. Microcontroller and Application, Manish Bhargava, FPH
8. "Microcontroller – Fundamentals and Applications with Pic Valder – Perez Yeesdee Publishers, Tayler & Francis

DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: 2044305	Theory			No. of period in one session: 42			Credits
	No. of Periods per Week			Full Marks:	:	100	03
	L	T	P/S	ESE	:	70	
	03	-	-	T. A	:	10	
				C.T	:	20	

Course Objective:

This subject will allow students to develop understanding of the basic concepts of data in general and Relational Database System in particular. The studentswill learn Database concept, Data Structure, Data Models, various approaches to Database design, strengths of relational model, Normalization.

Course outcomes: After completion of course, students would be able to:

1. At the end of the course the student will be able to:
2. Develop Database System to handle the real-world problem.
3. Understand Database design and normalization techniques.
4. Use Standard Query Language and its various versions.

CONTENTS: THEORY

Chapter	Name of the Topic	Hours
Unit I	**An Overview of the Database Management System:** What is database? Why database? Database system, Databasemanagement system (DBMS), advantage of DBMS. **An Architecture of the Database system:** Three level of architecture, logical view, physical view,conceptual view, logical data independence, physical data independence.	**06**
Unit II	**Relational Database Management System (RDBMS):** Introduction, RDBMS terminology, relational model, base tables, keys, primary key, foreign key, constraints, code rules. **Database Design:** Normalization Normal forms – 1NF , 2NF , 3NF , BCNF , 4NF ,and 5NF, E-R Diagram , Mapping E-R diagram to database tables.	**08**
Unit III	**MariaDB:** Introduction to MariaDB, Data types, SQL commands, Create,insert, update, delete, drop, alter, SQL function (string function, date function), indexing, Key, primary key, foreign key.	**08**
Unit IV	**Manipulating Data with MariaDB:** SQL statements, select, like clause, group-by, order-by , joins-left join, natural join , right join , union , correlated and nestedqueries , Backup & restore.	**08**
Unit V	**NoSQL Database Technology:** Introduction to NoSQL database, Difference between relational & NoSQL database, NoSQL features, types, advantage, Architecture of MongoDB, documents, collections, dynamicschemas, Mongo shell, Mongo sever & client, data types, embedded documents, creating configuration file for Mongo. **Selecting the Right Database:** Selecting of right database, RDBMS or NoSQL, selection of database based on performance, data size, type of data, frequency of accessing data, business needs, type of application.	**12**

Reference Books:

1. Database Management Systems, First Edition, 2002, Vikas Publishing House- A.Leon & M. Leon
2. Fundamentals of Database Systems, Third Edition, 2000, Addison Wesley- R. Elmasri, S. Navathe
3. Database System Concepts, Third Edition, 1997, McGraw-Hill Internation- H. Korth, A. Silberschatz
4. An Introduction to Database Systems, Galgotia Publication- B. Desai
5. Database Processing: Fundamentals, Design Implementation, Prentice Hall of -D.K. Kroenke India.
6. Database Management Systems, First Edition, 1996, McGraw Hill - P. Bhattacharya and A.K. Majumdar
7. Database System Concepts, Fourth Edition, 1997, Tata McGraw Hill - Abraham Silberschtz, Henry Korth & S. Sudarshan

DIGITAL SYSTEM & COMPUTER ORGANIZATION LAB

SUBJECT CODE:	Theory			No. of period in one session: 56			Credits
	No. of Periods per Week			Full Marks:	:	50	02
	L	T	P/S	Internal (PA)	:	15	
2044306	-	-	04	External (ESE)	:	35	

Practical Objective:

The subject will help the students to learn facts, concepts, principle and procedure of digital electronics. These techniques can be used for designing sequential and combinational circuits which forms the basis of any electronic device. Also, this subject is designed to give clear idea about working principles of 8085 microprocessor.

Practical outcomes: After completion of course, students would be able to:

1. To learn about various basic concepts of digital electronics and familiarity with available chips.
2. Understand the various arithmetic circuits, counter design.
3. To know about registers, encoder and decoder.
4. To learn about half and full adder.
5. Understand the half and full subtractor.
6. To learn about the multiplexer and demultiplexer.

CONTENTS: PRACTICAL

Perform any eight experiments:	
1.	Study of logic Gates and verify Truth Table.
2.	Study of S-R, J-K, T and D Flip Flop.
3.	Study of Serial Registers.
4.	Study of Parallel Registers
5.	To study of 4-bit UP/DOWN asynchronous Counter.
6.	Study of 4-bit UP/DOWN synchronous Counter.
7.	Study of Encoder.
8.	Study of Decoder.
9.	Study of Half Adder.
10.	Study of Full Adder.
11.	Study of Full Subtractor.
12.	Study of Multiplexer.
13.	Study of Demultiplexer.

Reference Books:

1. Digital Electronics and Applications, McGraw Hills Publishers. - Malvino Leach
2. Digital Logic and Computer Design, Prentice Hall of India Ltd., New Delhi. - Morries Marrow
3. Digital Integrated Electronics, Prentice Hall of India Ltd., New Delhi - Herbert Raub and DonalSachilling
4. Digital Electronics, Prentice Hall of India Ltd., New Delhi – Rajaraman
5. Microelectronics, McGraw Hill, 1987 - J. Millman and A. Grabel
6. Linear Integrated Circuits, Wiley Eastern, 1991 - D. Roychaudhuri and S.B. Jani

DATABASE MANAGEMENT SYSTEM LAB

SUBJECT CODE: 2044307	Practical			No. of period in one session: 56			Credits
	No. of Periods per Week			Full Marks:	:	50	02
	L	T	P/S	Internal (PA)	:	15	
	-	-	04	External (ESE)	:	35	

Practical Objective:

This Lab course is intended to practice whatever is taught in theory class of 'Introduction to DBMS'. A few sample case studies are listed with some suggested activities. More case studies may be added to this list. You need to develop these case studies, apply all relevant concepts learnt in theory class as the course progress, and identify activities/operations that may be performed on the database. It will be a good idea to also use concepts learnt in the course on Software Engineering/SSAD.

Practical Outcomes: After completing the course, the students will understand

1. To learn about Design of a database and database-based applications
2. To know about use a DBMS
3. The critical role of database system in designing several information system-basedsoftware systems or applications.

CONTENTS: PRACTICAL

Perform any eight experiments:	
1.	To know installation of Oracle / MY SQL / Mongo DB
2.	Exercise on creating tables, inserting records and updating records
3.	To modify the structure of the table
4.	Exercise on Select command
5.	Exercise on querying the table using clauses like WHERE, ORDER,IN, AND, OR, NOT
6.	Exercise on various group functions
7.	Implementation of Number functions, character functions, conversion functions and date functions
8.	Implementation of set operators
9.	Implementation of sub queries
10.	Implementation of Joins
11.	Exercise on various date and number format models
12.	Exercise on creating tables with integrity constraints
13.	Exercise on Creation and Dropping of Database
14.	Exercise on Creation and Dropping of Collections.
15.	Study of commands of MongoDB- Insert, update, find, delete andsorting of Documents.

Reference Book:

1. Elmasri & Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, Tata McGraw- Hill, Delhi, India.
3. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw- Hill, New Delhi, India.
4. Introduction to Database Systems, C.J.Date, Pearson Education
5. Introduction to SQL, Rick F.Vander Lans, Pearson Education

DATA STRUCTURE USING C LAB

SUBJECT CODE: 2044308	Practical			No. of period in one session:56			Credits
	No. of Periods per Week			Full Marks:	:	50	02
	L	T	P/S	Internal (PA)	:	15	
	-	-	04	External (ESE)	:	35	

Practical Objective:

Implement relevant algorithms using Data structure. To provide the knowledge of basic data structures and their implementations and to understand importance of data structures in context of writing efficient programs.

Practical Outcomes: After completing the course, the students will understand

1. To perform basic operations on array.
2. To apply different searching and sorting techniques.
3. To implement basic operations on stack and queue using array representation

CONTENTS	
1.	Write a 'C' program to create and implement a SINGLY LINKEDLIST. Write functions to insert, delete, and display elements of the list.
2.	Write a 'C' program to create and implement a SINGLYCIRCULAR LINKEDLIST.
3.	Develop a 'C' program to create and implement a STACK usingarrays.
4.	Write a 'C' program to create and implement a STACK usinglinked lists.
5.	Develop a 'C' program to create and implement a QUEUE usingarrays.
6.	Develop a 'C' program to create and implement a QUEUE usinglinked lists.
7.	Develop a 'C' program to create and implement a CIRCULARQUEUE using arrays.
8.	Develop a 'C' program to create a BINARY TREE. Write functionsto perform the various traversals on the tree.
9.	Develop a 'C' program to create a BINARY SEARCH TREE. Writefunctions to perform the various traversals on the tree.
10.	Write a 'C' program to create and implement SELECTION SORTING.
11.	Develop a 'C' program to create and implement INSERTION SORTING.
12.	Develop a 'C' program to create and implement BUBBLE SORTING.
13.	Develop a 'C' program to create and implement MERGE SORTINGon two sorted list.
14.	Write a program to create and implement LINEAR SEARCHING.
15.	Write a program to create and implement BINARY SEARCHING.

Reference Book:

1. Data Structure Using 'C', Balaguruswami, mcGraw Hill Education, 2013
2. Data Structure Using 'C', Lipschutz, mcGraw Hill Education, 2013
3. Data Structure Using 'C',ISRD , mcGraw Hill Education, 2013
4. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House
5. Data Structure and Algorithms, narasimha karumanchi, Made Easy

DIGITAL SYSTEM AND COMPUTER ORGANIZATION (T.W)

SUBJECT CODE:	Term Work			No. of period in one session: 32			Credits
	No. of Periods per Week			Full Marks:	:	50	
2044309	L	T	P/S	Internal (PA)	:	15	01
		-	02	External (ESE)	:	35	

Course Objective:

1. Understanding the behaviour of Logic Gates, Adders, Decoders, Multiplexers and Flip-Flops.
2. Understanding the behaviour of ALU, RAM, STACK and PROCESSOR from working modules and themodules designed by the student as part of the experiment.

Course Outcomes: After completing the course, the students will understand

1. Analyse the behaviour of logic gates
2. Design combinational circuits for basic components of computer system and applications.
3. Analyse the operational behaviour and applications of various flip-flop.
4. Design Arithmetic logic units and different types of memory blocks.

Contents: Term Work	
1.	Introduction to Verilog HDL/VHDL
2.	Verify the behavior of logic gates using truth tables (AND, OR, NOT, XOR, NAND, NOR)
3.	Implementing HALF ADDER, FULL ADDER using basic logicgates
4.	Implementing Binary -to -Gray, Gray -to -Binary code conversions
5.	Implementing 3-8line DECODER
6.	Implementing 4x1 and 8x1 MULTIPLEXERS.
7.	Verify the excitation tables of various FLIP-FLOPS
8.	Design of an 8-bit Input/Output system with four 8-bit Internal Registers.
9.	Design of an 8-bit ARITHMETIC LOGIC UNIT.Design of 24x8 (16 byte) RAM. Design of 24x8 (16 byte) STACK. Implementation of a 4-bit PROCESSOR.

Reference Book:

1. A Verilog HDL Primer by J. Bhasker Bk & Hardcover; Published by Star Galaxy Press. ISBN: 0-9656277-4-8
2. Verilog HDL: A Guide to Digital Design and Synthesis by Samir Palikir Published by Prentice HallPublication date: March 1996

3. Patterson, D.A., and Hennessy, J.L., "Computer Organization and Design: The Hardware/Software Interface"Morgan Kaufmann Publishers, 4th Edition, Inc.2005

TERM WORK
Course Under Moocs/ NPTEL / Others

Subject Code: 2044310	TW						Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/S	Internal (PA)	:	07	
	—	—	2	External (ESE)	:	18	

Course objectives:

ABOUT SWAYAM:

This is done through a platform that facilitates hosting of all the courses, taught in classrooms from Class 9 till post-graduation to be accessed by anyone, anywhere at any time. All the courses are interactive, prepared by the best teachers in the country and are available, free of cost to any learner. More than 1,000 specially chosen faculty and teachers from across the country have participated in preparing these courses.

The courses hosted on SWAYAM are in 4 quadrants – (1) video lecture, (2) specially prepared reading material that can be downloaded/printed (3) self-assessment tests through tests and quizzes and (4) an online discussion forum for clearing the doubts. Steps have been taken to enrich the learning experience by using audio-video and multi-media and state of the art pedagogy / technology.

In order to ensure that best quality content is produced and delivered, nine National Coordinators have been appointed. They are:

- AICTE (All India Council for Technical Education) for self-paced and international courses
- NPTEL (National Programme on Technology Enhanced Learning) for Engineering
- UGC (University Grants Commission) for non-technical post-graduation education
- CEC (Consortium for Educational Communication) for under-graduate education
- NCERT (National Council of Educational Research and Training) for school education
- NIOS (National Institute of Open Schooling) for school education
- IGNOU (Indira Gandhi National Open University) for out-of-school students
- IIMB (Indian Institute of Management, Bangalore) for management studies

NITTTR (National Institute of Technical Teachers Training and Research) for Teacher Training programme

Courses delivered through SWAYAM are available free of cost to the learners, however learners wanting a SWAYAM certificate should register for the final proctored exams that come at a fee and attend in-person at designated centres on specified dates. Eligibility for the certificate will be announced on the course page and learners will get certificates only if this criteria is matched. Universities/colleges approving credit transfer for these courses can use the marks/certificate obtained in these courses for the same.

Below is a list of all SWAYAM courses categorized by subject. **Student can register to portal and complete the course.**

- ✓ Humanities
- ✓ Business
- ✓ Programming
- ✓ Mathematics
- ✓ Social Sciences
- ✓ Data Science
- ✓ Education & Teaching
- ✓ Computer Science
- ✓ Health & Medicine
- ✓ Personal Development
- ✓ Science
- ✓ Engineering
- ✓ Art & Design

About NPTEL

The National Programme on Technology Enhanced Learning (NPTEL) was initiated by seven Indian Institutes of Technology (Bombay, Delhi, Kanpur, Kharagpur, Madras, Guwahati and Roorkee) along with the Indian Institute of Science, Bangalore in 2003. Five core disciplines were identified, namely, civil engineering, computer science and engineering, electrical engineering, electronics and communication engineering and mechanical engineering and 235 courses in web/video format were developed in this phase.

The main goal of NPTEL Phase II (2009-14) was to build on the engineering and core science courses launched previously in NPTEL Phase I. An additional 600 web and video courses were created in all major branches of engineering, physical sciences at the undergraduate and postgraduate levels and management courses at the postgraduate level. Several improvements such as indexing of all video and web courses and keyword search were implemented.

Some highlights:
Largest online repository in the world of courses in engineering, basic sciences and selected humanities and social sciences subjects

- ✓ Youtube channel for NPTEL – most subscribed educational channel, 1.6 million+ channel subscribers, 900 million+ views
- ✓ More than 56000 hours of video content
- ✓ Most accessed library of peer-reviewed educational content in the world
- ✓ 52000+ hours of transcribed content; 51000+ hours of subtitled videos

- NPTEL MOOCs

NPTEL began offering open online courses in March 2014 along with certificates from the IITs/IISc for those who completed the courses successfully.

It is now possible for ANYONE outside the IIT System to be able to do an online certification course from NPTEL and get a certificate from the IITs. IITs are reaching out and taking education to the homes of people through this initiative.

- Why was this initiative through the model of Open Online Courses?

Massive Open Online Courses (MOOC) is essentially an asynchronous platform and a process for teaching through pre-recorded lectures, resource video materials, lecture notes, assignments and quizzes, which are usually online and provide self-assessment in regular intervals during learning.

The learning, through scheduling of fixed time duration for completion of courses and, therefore, the simultaneous participation of teachers and a large number of students may be termed synchronous and is thus similar to a classroom, albeit on the Internet and being much larger in size.

When offered with consideration for students in non-urban and rural areas through supplementary DVDs and mobile delivered content, they enable quality and equitable access to a much larger population of students and can lead to a significant rise in the Gross Enrolment Ratio.

These courses are open for anyone to access – at no cost. So anyone who is interested in learning gets access to quality content, which also includes discussion with the content creator and access to assignments for self-testing.

The faculty who are currently offering courses are from the IITs or from other reputed institutes such as CMI, IMSc etc.

- NPTEL Online Certification

The objective of enabling students obtains certificates for courses are to make students employable in the industry or pursue a suitable higher education programme.

Through an online portal, 4-, 8-, or 12-week online courses, typically on topics relevant to students in all years of higher education along with basic core courses in sciences and humanities with exposure to relevant tools and technologies, are being offered. The enrolment to and learning from these courses involves no cost. Following these online courses, an in-person, proctored certification exam will be conducted and a certificate is provided through the participating institutions and industry, when applicable.

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PYTHON (Term Work)

Subject Code: 2018311	Term Work			No. of period in one session:30			Credits
	No. of Periods Per Week			Full Marks	:	25	01
	L	T	P/TW	Internal (PA)	:	07	
	—	—	02	External (ESE)	:	18	

Course Objective:

Implement the basic programs using python.

Course Outcomes: After completing the course, the students will understand

1. Perform basic operations on python.
2. Apply different techniques of python such as conditional statements, looping etc to solve the basic programming problem.
3. Implement basic operations to read and write the files in python.

Contents: Term Work	
1.	Write a program to demonstrate basic data type in python.
2.	Write a program to compute distance between two-point staking input from the user (Pythagorean Theorem)
3.	Write a python program Using for loop, write a program thatprintsout the decimal equivalent of 1+½+1/3….1/n
4.	Write a Python program to find first n prime numbers. Write a program to demonstrate list and tuple inpython.
5.	Write a program using a for loop that loops over a sequence.
6.	Write a program using a while loop that asks the user for a numberand prints a countdown from that number to zero.
7.	Write a Python Program to add matrices.
8.	Write a Python program to multiply matrices.
9.	Write a Python program to check if a string is palindrome or not.
10.	Write a Python program to Extract Unique values dictionary values
11.	Write a Python program to read file word by word
12.	Write a Python program to Get number of characters, words.

Reference books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Starting Out with Python, Tony Gaddis, Pearson
3. Core Python Programming, Wesley J. Chun, Prentice Hall
4. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University
5. Introduction to Computation and Programming Using Python. John
6. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
7. Starting Out with Python, Tony Gaddis, Pearson
8. Core Python Programming, Wesley J. Chun, Prentice Hall
9. Python Programming: Using Problem Solving Approach, Reema Thareja, Oxford University

10. Introduction to Computation and Programming Using Python. John V. Guttag, MIT Press.