NOTIFICATION

No. 137 /2021 Date : 02/12/2021

Subject :- Implementation of new syllabi of Semester III & IV of B.E. ([Artificial Intelligence & Data Science] (C.B.C.S.) as per A.I.C.T.E. Model Curriculum from the session 2021-2022 & onwards.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi of **Semester III & IV of B.E. ([Artificial Intelligence & Data Science] (**C.B.C.S.**)** as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2021-2022 and onwards in phase wise manner as per **Appendix – A** :

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SYLLABUS PRESCRIBED FOR SEMESTER III & IV B.E. [ARTIFICIAL INTELLIGENCE & DATA SCIENCE]

SEMESTER III

3AD01 MATHEMATICS FOR DATA SCIENCE

3AD01 ENGINEERING MATHEMATICS-III

Course Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Apply Laplace transform to find solution of linear differential equations. And solve problems related to Fourier Transform
- Compute and interpret the correlation coefficient.
- Compute the Analytic function and Complex Analysis.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and linear differential equations .
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Demonstrate the basic concepts of probability and statistics.
5. Apply the knowledge of Complex Analysis.
6. Apply the knowledge of vector calculus to solve physical problems.

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variation of parameters, Cauchyôs and Legendreôs linear differential equations. (7)

UNIT-II: **Laplace Transform:-** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function . (7)

UNIT-III: **a) Applications of Laplace Transform:-** Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method

b) Fourier Transform:- Definition, standard forms, Fourier transforms, properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals, inverse Fourier transforms.(7)

SECTION-B

UNIT-IV: **a) Partial differential equation** of first order of following form:-
(i)f (p,q) = 0; (ii) f (p,q,z) = 0; (iii) f (x, p) = g (y,q); (iv) P p + Qq = R
(Lagranges Form); (v) z = px + qy + f(p,q) (Clairauts form)
b) Statistics- Curve fitting: Least Square Method, Coefficient of Correlations, Lines of Regression. (7)

UNIT-V: Complex Analysis: - Functions of complex variables, Analytic function, Cauchy-Riemann conditions, Harmonic function, Harmonic conjugate functions, Milneôs Method, conformal mappings (translation, rotation, magnification and bilinear transformation) , Expansion of function in Taylorôs and Laurentôs series. (7)

UNIT–VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical mean in expansion Formulae (without proof), line, surface, volume integrals, irrotational and Solenoidal Vector fields. (7)

Text Books:

1. Elements of Applied Mathematics Vol. II by P. N. Wartikar and J.N. Wartikar,
2. Higher Engg. Mathematics by B.S. Grewal.

Reference Books:

1. Advancing Engg. Mathematics by E.K.Kreyzig.
2. A text book of Differential Calculus by Gorakh Prasad.
3. A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
4. Engineering Mathematics by Ravish R Singh, Mukul Bhatt.

3AD02 DISCRETE STRUCTURE

3AD02	**Discrete Structure**	**L-3, T-0, C-3**

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure by being able to do each of the following:

1.Learn basic terminology, formal logic, proofs, sets, relations,functions, recursion

2. Use formal logic proof and logical reasoning to solve problems

3. Relate the ideas of mathematical induction to recursion and recursively defined structures

4. Learning graphs, trees and related algorithms

5. Relate interpret and apply these concepts to various areas of Computer Science

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: **Mathematical Logic:** **Hours: 8**

Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

Unit II: **Theory of inference** **Hours: 8**

The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus,Inference theory of the Predicate Calculus.

Unit III: **Set Theory** **Hours: 8**

Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

Unit IV: **Algebraic Structures** **Hours: 8**

Semi-groups and Monoids, Product &Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

Unit V: Lattice & Boolean Algebra Hours: 8

Lattices, partially ordered sets, Boolean algebra,Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

Unit VI: GraphsTheory Hours: 8

Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book: J.P.Trembley,R.Manohar:òDiscrete Mathematical Structures with application to Computer Scienceò 1988(MCG)

Reference Books:

[1] C.L.Liu : ñCombinational Mathematiesò Mc Graw Hill, 1988
[2] Stanant ñDiscrete Structureò Prentice Hall.
[3] C.L.Liu ñElement of Discrete Mathematicsò Second Edition McGrawHill, 1987
[4]Norman L.Biggs ñDiscrete Mathematicsò Second Edition,Oxford

3AD03 PROGRAMMING METHODOLOGY USING PYTHON

3AD03	**Programming Methodology using Python**	**L-3, T-0, C-3**

Course Prerequisite: Programming fundamentals

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Programming Methodology using Python by being able to do each of the following:

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of modules, packages and built-in functions to navigate the file system.
5. Infer the Object-oriented Programming concepts in Python.
6. To develop the ability to write database applications in Python.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply various fundamentals for problem solving using python
2. Develop proficiency in creating applications using the Python Programming Language.
3. Understand the various data structures available in Python programming language and apply them in solving computational problems.
4. Draw various kinds of plots.

Unit I Introduction 8 Hrs

Basic concepts of Python-Variables-Data types- Operators-Conditional Statements Looping-Control Statements-If-If else-Nested If else-Looping Statements- for-while nested loop-Control Statements.

Unit II Strings and Functions 8 Hrs

String Manipulation-Accessing Strings- Basic Operations-String slices- Function and Methods- Functions-Defining a function- Calling a function- Types of functions Function Arguments-Anonymous functions- Global and local variables.

Unit III Data Structures in Python 8 Hrs

Lists-Introduction -Accessing list-Operations-Working with lists -Function and Method **Tuple**-Introduction-Accessing-Tuples-Operations- Working- Functions and Methods **Dictionaries**-Introduction- Accessing values in dictionaries- Working with dictionaries Properties- Functions.

Unit IV Classes and objects 8 Hrs

Overview of OOP, Class Definition, Creating Objects , Objects as Arguments, Objects as Return Values, Built-in Class Attributes, Inheritance- Overloading- Overriding- Data hiding

Unit V Modules and Packages 8 Hrs

Standard modules-Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages.

Unit VI Working with Data in Python 8 Hrs

Printing on screen- Reading data from keyboard- Opening and closing file- Reading and writing files- Functions- Loading Data with Pandas-Numpy.

Text Book: Martin C Brown, ñPython: The Complete Referenceò, MCGraw Hill

Reference Books:

1. Larry Lutz, ñPython for Beginners: Step-By-Step Guide to Learning Python Programmingò, CreateSpace Independent Publishing Platform, First edition, ISBN- 1717410588, 9781717410580, 2018
2. Nicholas Ayden, ñPython Programmingò, Independently Published, First Edition, ISBN- 1707051933, 9781707051939, 2019.
3. Michaƀaworski, Tarek Ziadé, ñExpert Python Programmingò, Packt Publishing Ltd., Third Edition, ISBN-9781789808896, 2019.

3AD04 DATA STRUCTURES

3AD04 Data Structures **L-3, T-0, C-3**

Course Prerequisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Data Structure by being able to do each of the following:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

Unit I: Introduction to Data Structures **Hours: 8**

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II: Array & Record Structure **Hours: 8**

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays. Record structures and Matrices.

Unit III: Linked lists **Hours: 8**

Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion & deletion operations on linked lists. Header linked lists, Two- way linked lists.

Unit IV: Stack & Queue **Hours: 8**

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.
Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues.

Unit V: Trees **Hours: 8**

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heapsort, Path length &Huffmanƈs algorithm.

Unit VI: Graphs & Sorting Algorithms **Hours: 8**

Introduction to Graphs, Memory representation of graphs, Warshallsƈalgorithm, operations on Graphs, Breadth First Search, Depth First Search
Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort.

Text BookS:

1. Seymour Lipschutz: Data Structures , Schaumƈs Outline Series, McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education

3AD05 ANALOG & DIGITAL ELECTRONICS

3AD05	Analog & Digital Electronics	L-3, T-0, C-3

Course Prerequisite: Basic knowledge of Physics

Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Data Science and Statistics by being able to do each of the following:

1. To get the introductory knowledge of basic analog devices like PN Junction Diode, Bipolar Junction Transistor and Field Effect Transistor.
2. To understand the basic concepts & working of operational amplifier
3. To understand number systems and conversion between different number systems.
4. To get basics knowledge about digital ICs and digital systems.
5. To study the design of combinational circuits and sequential circuits

Course Outcomes (Expected Outcome):

On completion of the course, the students will be able to

1. Explain basic concepts of semiconductor devices and analog ICs with its applications.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization techniques to obtain minimized expressions.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: Unit Title: PN Diode, BJT and FET Hours: 7

PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, , BJT as Switch, Common-Base Characteristics, Common-Emitter Characteristics, Common-Collector Characteristics . Basic operation of Junction Field Effect Transistors, MOSFETs & CMOS.

Unit II: Operational Amplifiers Hours: 7

Introduction to Operation amplifier; Block schematic, study of IC 741 op-amp, op-amp parameter, Application of Op-amps: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder and subtractor.

Unit III: Unit Title: Number System Hours: 6

Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, 1s and 2s Complements Representation, Subtraction using 1ऽ and 2ऽ Complements, BCD, Gray Code, and ASCII codes.

Unit IV: Unit Title: Minimization Technique Hours: 6

Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 4 variable), Limitation of Karnaugh Map.

Unit V: Unit Title: Combinational Circuits Hours: 7

Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Unit Title: Sequential Circuits Hours: 7

Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Books:

[1] David A. Bell: ñElectronic Devices and Circuitsò, 5th Ed, Oxford University Press.
[2] Jain R.P. ñModern Digital Electronicsò, 3rd Ed, TMH.
[3] Gayakwad R. A. ñOp-Amp & Linear Integrated Circuit, PHI publications 4th Ed.

Reference Books:

[1] Millman&Halkies: ñElectronic Devices & Circuitsò, 2e, McGraw Hill.
[2] Sedra& Smith: ñMicroelectronics Circuitsò, 5e, Oxford University Press.
[3] Anand Kumar: ñSwitching Theory and Logic Designò, 3e, PHI Learning Private Limited
[4] Wakerly, ñDigital Design: Principles and Practicesò, 3 e, Pearson Education, 2004.

3AD06 PROGRAMMING METHODOLOGY USING PYTHON - LAB

3AD06	**Programming Methodology using Python Lab**	P-2,C-1
Course Prerequisite:	Basics of programming Language	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Programming Methodology using Python Lab by being able to do each of the following: 1. Interpret the use of procedural statements like assignments, conditional statements, loops and function calls. Learn the syntax and semantics and create the functions in Python. 2. Infer the supported data structures like lists, dictionaries and tuples in Python. 3. Illustrate the application of matrices and regular expressions in building the Python programs. 4. Discover the use of external modules in creating excel files and navigating the file systems. 5. Describe the need for Object-oriented programming concepts in Python.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Apply the Python language syntax including control statements, loops and functions. 2. Understand the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data. 3. Interpret the concepts of Object-oriented programming as used in Python 4. Identify the external modules for creating and writing data to excel files and inspect the file operations to navigate the file systems.	

List of Experiments: Minimum 12 Experiments based on each conceptare to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to understand basic Python interpreter
2. Write a program to perform String Manipulation and Functions
3. Write a program to implement Python Data structures
4. Implement Classes and Objects using Python
5. Design a program to understand Overloading in Python
6. Design a program to understand Overriding in Python
7. Implement Inheritance using Python
8. Develop a Python code for Information hiding
9. Implement Pythonôs Modules and Packages
10. Writ a program to illustrate concept of File handling
11. Write a code to load Data with library such as Pandas-Numpy.

Text Book: Martin C Brown, ñPython: The Complete Referenceò, McGraw Hill

Reference Books:

1. Larry Lutz, ñPython for Beginners: Step-By-Step Guide to Learning Python Programmingò, CreateSpace Independent Publishing Platform, First edition, ISBN- 1717410588, 9781717410580, 2018
2. Nicholas Ayden, ñPython Programmingò, Independently Published, First Edition, ISBN- 1707051933, 9781707051939, 2019.
3. MichağJaworski, Tarek Ziadé, ñExpert Python Programmingò, Packt Publishing Ltd., Third Edition, ISBN-9781789808896, 2019.

3AD07 DATA STRUCTURES – LAB

3AD07	**Data Structures Lab**	P-2, C-1
Course Prerequisite:	Basics of programming Language & Logic Building Skills	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Data Structures Lab by being able to do each of the following: 1. To understand the linear and nonlinear data Structures and its memory representations. 2. To perform different operations on data structures such as insertion, deletion, searching and traversing. 3. To understand various data searching and sorting methods with its complexity. 4. To introduce various techniques for representation of the data in the real world.	

Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Apply various linear and nonlinear data structure. 2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures 3. Examine the usage of various structures in approaching the problem solution. 4. Choose appropriate data structure for specified problem domain

List of Experiments: This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find its location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list

(a) Traversing the linked list.

(a) Insert a node at the front of the linked list.

(b) Delete a last node of the linked list.

(d) Searching a Linked list.

9. To study and implement following operations on the doubly linked list.

(a)Insert a node at the front of the linked list.

(b)Insert a node at the end of the linked list.

(c)Delete a last node of the linked list.

(d)Delete a node before specified position.

10. To study and implement following operations on the circular linked list.

(a)Insert a node at the end of the linked list.

(b)Insert a node before specified position.

(c)Delete a first node of the linked list.

(d)Delete a node after specified position.

11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.

Text Books:

1. SeymourLipschutz: Data Structures , Schaum's Outline Series,McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education

3AD08 ANALOG & DIGITAL ELECTRONICS - LAB

3AD08	Analog & Digital Electronics Lab	P-02, C-1

Course Prerequisite:	Basic knowledge of Physics
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Analog & Digital Electronics Lab by being able to do each of the following: 1. To get the introductory knowledge of basic analog devices like PN Junction Diode, Bipolar Junction Transistor and Field Effect Transistor. 2. To understand the basic concepts & working of operational amplifier 3. To understand number systems and conversion between different number systems. 4. To get basics knowledge about digital ICs and digital systems. 5. To study the design of combinational circuits and sequential circuits
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Explain basic concepts of semiconductor devices and analog ICs with its applications. 2. Compare different Number System and basics of conversion of number systems. 3. Realize different minimization techniques to obtain minimized expressions. 4. Design Combinational Circuits. 5. Design and Develop Sequential Circuits.

Experiments List:

List of Experiments: This is a sample list of Experiments; minimum 8 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1) To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2) To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3) To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4) To plot static characteristics of FET & calculate its parameters gm, rd and ε .
5) Design and Implementation of Op-amp as an inverting amplifier.
6) Design and Implementation of Op-amp as a non-inverting amplifier
7) To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
8) Study and verify the truth table of half adder and full adder using logic gates.
9) Study and verify the truth table of half subtractor and full subtractor using logic gates
10) To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
11) Implementation of 4×1 multiplexer using logic gates.
12) Implementation and verification of Demultiplexer and Encoder using logic gates.
13) Implementation of 4bit parallel adder using 7483 IC.
14) Design and verify the 4 bit synchronous counter.
15) Design and verify the 4 bit asynchronous counter.
16) Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiment beyond syllabus:

1) To design and find frequency of A stable multi-vibrator using IC 555.
2) Operation of op amp as Oscillator
3) Design of DC voltage supply using 78xx series

Text Books:

[1] David A. Bell: ñElectronic Devices and Circuitsò, 5th Ed, Oxford University Press.
[2] Jain R.P. ñModern Digital Electronicsò, 3rd Ed, TMH.
[3] Gayakwad R. A. ñOp-Amp & Linear Integrated Circuit, PHI publications 4th Ed.

Reference Books:

[1] Millman & Halkies: ñElectronic Devices & Circuitsò, 2e, McGraw Hill.
[2] Sedra & Smith: ñMicroelectronics Circuitsò, 5e, Oxford University Press.
[3] Anand Kumar: ñSwitching Theory and Logic Designò, 3e, PHI Learning Private Limited
[4] Wakerly, ñDigital Design: Principles and Practicesò, 3 e, Pearson Education, 2004.

3AD09 C SKILL-LAB I

3AD09	Course Title: **C Skill-Lab I**	P-2,C-1

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of PHP by being able to do each of the following:

1. To be able to program design with functions using PHP.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using PHP programming.
5. To be able to design web applications using PHP programming.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Describe the Basic syntax variable, constant, operator expression and data type in PHP.
2. Design HTML Form with PHP
3. Interpret different Decision Making, loop statements, Functions, string, array in PHP.
4. Experiment with File and directories.
5. GenerateImages and database connectivity.

List of Experiments: This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply) ï **Mini Project Compulsory.**

1. Introduction to HTML Installation of PHP and Web server.
2. Write a HTML code to display your family information.
3. Write a HTML code to display your college with hyperlink
4. Introduction to CSS
5. Create a CSS style sheet and use it to display your name.
6. Write a program to create menu using HTML and CSS
7. Create a PHP page using functions for comparing three integers and print the largest number.
8. WAP in PHP to check whether the given number is prime or not.
9. Write a PHP function to calculate the factorial of a number.
10. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
11. Write a PHP function that checks if a string is all lower case.
12. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
13. Write a PHP script that removes the whitespaces from a string. Sample string : ñThe quick brown foxò Expected Output : ñThe quick brown foxò
14. Write a program to sort an array.
15. WAP to print first n even numbers.
16. Write a PHP script that finds out the sum of first n odd numbers.
17. Create a script to construct the following pattern, using nested for loop.

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

18. Write a PHP program to print Fibonacci series using recursion.
19. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
20. Using switch case and dropdown list display a ñHelloò message depending on the language selected in drop down list.
21. Write a PHP script to replace the first 'the' of the following string with 'That'. Sample : 'the quick brown fox jumps over the lazy dog.' Expected Result : That quick brown fox jumps over the lazy dog
22. Write a simple PHP program to check that emails are valid.
23. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered
24. Write a code in Java to display student information from database.
25. Write a code in .net to display student information from database.
26. **Develop any Mini Project like " Dynamic College WEB site".**

SEMESTER IV

4AD01 ARTIFICIAL INTELLIGENCE

4AD01	**ARTIFICIAL INTELLIGENCE**	L-3, T-0, C-3
Course Prerequisite:	Basic concepts of Data Structures, Algorithms, Programming	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Artificial Intelligence by being able to do each of the following: 1. To present an overview of Artificial Intelligence (AI) principles and approaches. 2. To understand the historical evolution of Artificial Intelligence. 3. To learn various searching techniques and identify to address a particular problem).	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture. 2. Formulate problems as state space search problem & efficiently solve them. 3. Summarize the various searching techniques, constraint satisfaction problem and example problems -game playing techniques. 4. Apply AI techniques in applications which involve perception, reasoning and learning. 5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.	

Unit I: Unit Title: **Introduction to AI** **Hours: 7**

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI, **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Unit Title: **Problem Solving Through AI** **Hours: 7**

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems.

Unit III: Unit Title: **Uninformed Search Strategies**

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bi-directional Search, Depth Limited Search, Iterative Deepening Depth-First Search.

Unit :IV Unit Title:**Informed Search Strategies** Hours:08Hrs

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis.

Unit V: Unit Title: **Adversarial Search & Games** Hours:08 Hrs

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms.

Unit VI: Unit Title: **Introduction to Knowledge** Hours:08 Hrs

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering.

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by Rajendra Akerkar (PHI Learning Pvt. Ltd.

4AD02 STATISTICAL METHODS

Course Pre-requisite: Some Linear Algebra,

Course Objectives : The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science.

1. To understand nature of data used for statistical methods and its representation.
2. To incorporate the concepts of probability theory
3. Understand the most common discrete and continuous probability distributions and their real life applications.
4. Understand Estimation theory
5. Understand Test of Hypothesis as well as concept of p-values.

Course Outcomes : After successful completion of this course, students will be able to:

1. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
2. Apply measures of central tendency and measured of dispersion.
3. Use the basic probability rules, including additive and multiplicative laws.
4. Apply discrete and continuous probability distributions to various data science problems.
5. Estimate model parameters.
6. Identify appropriate hypothesis tests to apply to data.

Unit I : Introduction to Data and Representations:

Introduction to statistics, sources of data,Types of Data: Concepts of a statistical population and sample from a population; qualitative and quantitative data; nominal and ordinal data; cross sectional and time series data; discrete and continuous data; frequency and non- frequency data. Different types of scales - nominal, ordinal, ratio and interval.

Different types of presentations of data, data tabulation, describing categorical data, frequency distribution of categorical data, Describing numerical data, frequency table for numerical data, graphical representation, Frequency Distributions and Histograms; Pie Charts; Bar Charts: Pareto Chart, Scatter Plots (Degree of Association); Line Charts.

Unit II : Analysis of Quantitative Data:

Measures of Central Tendency: Ungrouped Data, mean, mode, median, Steps in Determining the Location ofa Percentile.
Measures of Variability: Ungrouped Data, Range, Inter-quartile Range, Mean Absolute Deviation, Variance, and Standard Deviation
Measures of Central Tendency and Variability: Grouped Data,
Measures of Shape, Skewness, Skewness and the Relationship of the Mean, Median, and Mode, Coefficient of Skewness, Kurtosis.

Unit III: Introduction to Probability Theory:

Definitionï Classical and axiomatic approaches. Laws of total and compound probability, conditional probability, Bayes Theorem. Random variable and its distribution function, mathematical expectation, generating functions (moment generating, characteristic and probability generating functions). Different modes of convergence laws of large numbers, central limit theorem, Joint distribution of two random variables, marginal and conditional distributions.

Unit IV: Probability distributions:

Discrete probability distributionsï uniform-mean, variance, moment generating functions,Binomial- mean, variance, moment generating functions, Poisson- mean, variance, moment generating functions,

Continuous probability distributionsï Continuous uniform- mean, variance, moment generating functions,Normal distributions, important properties (without derivation) mean, variance, moment generating functions, area under the normal curve related problems,

Unit V: Sampling Distributions and Estimation Theory:

Random, Nonrandom; Sampling Distribution of x-bar; Central Limit Theorem; z Formula for Sample Mean; Standard Error of Mean; Sampling from a Finite Population; Sampling Distribution of a Proportion, Standard Error of Proportion.

Estimation for Single Population: Estimating the Population Mean using z Statistic (ů Known); Estimating the Population Mean using the z Statistic when the Sample Size is Small; Estimating the Population Mean using t Statistic (ů Unknown); Estimating the Population Proportion; Estimating the Population Variance; Estimating Sample Size.

UNIT VI: **One Sample Test of Hypothesis and significance in data analysis:**
Introduction; Null Hypothesis, Alternate Hypothesis; Type I & Type II Errors, Testing Hypotheses about a Population Mean using z Statistic (ů Known); Using Critical Value Method to test Hypotheses, Examples; Population Mean Testing Hypotheses about a Population Mean using t Statistic (ů Unknown); Testing Hypotheses about a Proportion; Testing Hypotheses about a Variance.

Text Books :

1. Ken Black, ñBusiness Statistics for Contemporary Decision Makingò, Wiley Student Edition, 2010.
2. Montgomery, D. C., G.C. Runger,Applied Statistics and Probability for Engineers. 5th ed.New Delhi: Wiley-India, 2011.
3. Gupta, S.C. and Kapoor, V.K., ñFundamentals of Mathematics Statisticsò, Sultan Chand and Sons, 2001.

Reference Books :

1. An Introduction to Probability and Statistics by V.K. Rohatgi & A.K. Md.E.Saleh
2. Sheldon M. Ross, ñIntroduction to Probability and Statistics for Engineers and Scientistsò, Academic Press, (2009).
3. Shanmugam, R., Chattamvelli, R. Statistics for scientists and engineers, John Wiley, 2015.
4. Sheldon Ross, A First Course in Probability, Pearson, 2014.
5. Johnson, R.J., ñMiller and Freundôs Probability and Statistics for Engineersò 6th Edition, Prentice Hall of India, 2002.

4AD03 COMPUTER ARCHITECTURE AND OPERATING SYSTEM

4AD03	Computer Architecture and Operating System	L-3, T-0, P-0, C-3
Course Prerequisite:	Basic Knowledge of Data Structures	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Computer Architecture and Operating System by being able to do each of the following:	

1. To familiarize the basic concepts and structure of computers.
2. To understand concepts of CPU and its operations.
3. To help students in understanding of addressing modes and memory organization.
4. To make students aware of the kernel and shell structure of the operating systems.
5. To make students aware of the purpose, structure and functions of operating systems
6. To equip students with understanding of the various scheduling algorithms in OS.
7. To make students aware of understanding of memory management.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Understand basic structure and operation of computer.
2. Discuss the concepts of number representation and their operation.
3. Explain basic operation of Operating systems
4. Describe the memory management issues like external fragmentation, internal fragmentation.
5. Analyze and solve the scheduling algorithms.
6. Analyze the deadlock situation and resolve it.

Unit I: Unit Title: Basic Structure of Computer Hours: 7

Basic Structure of Computer H/W & S/W: Functional Units, Basic Operational Concepts, Bus structures, Addressing Methods and Machine Program Sequencing: Memory Locations, Addresses, Instruction and instruction sequencing, Addressing Modes. Basic I/O Operations.

Unit II: Unit Title: Processing Unit Hours: 8

Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing.

Unit III: Unit Title: Arithmetic Hours: 7

Number Representations, Design of Fast Adders, Signed Addition and Subtraction, Multiplication of Positive Numbers ,Booth Multiplier, Fast Multiplication ,Integer Division, Floating Point Numbers and Operations..

Unit :IV Unit Title: Introduction to OS Hours:08Hrs

Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit V: Unit Title: Process Scheduling and Synchronization Hours:08 Hrs

Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority. Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit VI: Unit Title: Memory Management and I/O System Hours:08 Hrs

Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing ,Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Books:

1. Avi Silberschatz ,P.B.Galvin, G.Gagne: ñOperating System Conceptsò (9/e) John-Wiley & Sons.
2. Carl Hamacher, ZvonkoVranesic and Safwat Zaky, ñComputer Organizationò, Fifth Edition, Tata McGraw-Hill.

Reference Books:

1. A.S Tanenbaum ñModern Operating Systemsò Pearson Education.
2. William Stallings, ñComputer Organization and Architecture: Designing for Performanceò, Eighth Edition, Pearson.
3. John P. Hayes, ñComputer Architecture and Organizationò, McGraw Hill Publication.
4. DA Patterson and JL Hennessy, Computer Organization and Design, Morgan Kaufmann Publisher, 2nd edition

4AD04 MICROCONTROLLER, SENSORS & ACTUATORS

4AD04 Microcontroller, Sensors & Actuators L-3, T-0, C-3

Course Prerequisite: Basic knowledge of Digital Circuits

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Microcontrollers, Sensors & Actuators by being able to do each of the following:

1. Explore microcontroller & its architecture
2. Assembly language Programming
3. Various Sensors & its interfacing
4. Different actuators & its interfacing

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Describe 8051 microcontroller and its architecture, also understand instruction processing
2. Design and Test assembly language programs using 8051 microcontroller instruction set
3. Concepts of serial & parallel data communication using 8051 microcontroller
4. Illustrate and realize the Interfacing of memory, various I/O devices & Sensors with 8051 microcontroller
5. Implementing the Interfacing of actuators ,relays, opto isolators & motors with 8051 microcontroller

Unit I: Introduction to Microcontrollers: Hours: 7

Difference between microprocessor & microcontroller. Introduction to microcontroller, Pin configuration description, Internal architecture of microcontroller 8051, Register structure, Internal memory, Timer structure & modes.

Unit II: Instruction Set of microcontroller 8051 Hours: 7

Instruction set of 8051 microcontroller, Addressing modes of 8051, Memory & I/O addressing

Unit III: Assembly Language Programming Hours: 7

Difference between machine language, Assembly language & high level languages, Its advantages and disadvantages, Programs using Assembly languages

Unit IV: Serial Data Communication Hours: 7

Basics of serial communication, Synchronous & Asynchronous data, Framing, Baud rate, Doubling baud rate, Use of SCON & SBUF register, Programming 8051 to transfer data serially, Programming 8051 to receive data serially.

Unit V: Sensors or Transducers Hours: 7

Principles, Classification & Characteristics of Sensors/Transducers, working of Analog to digital converter ADC 0808/0809, Its interfacing with 8051, Working of Digital to analog converter DAC 0808 & its interfacing with 8051, Temperature sensor LM35, Signal Conditioning and interfacing of LM35 with 8051.

Unit VI: Actuators Hours: 7

Electrical actuation systems, Electromechanical relays, Driving relay using ULN2803, Opto isolators& its interfacing with 8051, Stepper motor interfacing, DC motors interfacing & PWM, LCD interfacing with 8051

Text Books: Preferably Only 01 (Max. 02)

[1] M A Mazidi, J G Mazidi& R D Mckinlay: The 8051 Microcontroller & Embedded Systems using Assembly & C, Pearson Printice Hall publication, India
[2] D Patranbis: Sensors & Transducers, PHI learning Private Limited, India

Reference Books: [May be 05 to 06]

[1] M A Mazidi& J G Mazidi: The 8051 Microcontroller and Embedded System, Pearson Printice Hall publication, India
[2] Patranbis: Sensors & Actuators, Second Edition, PHI learning Private Limited, India, 2013
[3] W. Bolton: Mechatronics, Pearson Education Limited.

4AD05 THEORY OF COMPUTATION

4AD05	**Theory of Computation**	L-3, T-1, P-0, C-4
Course Prerequisite:	Discrete Mathematics, Data Structures	
Course Objectives:	Throughout the course, students will be expected to demonstrate their understanding of Theory of Computation by being able to do each of the following: **1.** To give an overview of the theoretical foundations of computer science from the perspective of formal languages **2.** To illustrate finite state machines to solve problems in computing **3.** To explain the hierarchy of problems arising in the computer sciences. **4.** To familiarize Regular grammars, context frees grammar	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to **1.** Understand basic concepts of formal languages of finite automata techniques **2.** Design Finite Automata for different Regular Expressions and Languages **3.** Construct context free grammar for various languages **4.** Solve various problems of applying normal form techniques, push down automata and Turing Machines	

Unit I FINITE AUTOMATA (FA) 8 Hrs

Definitionofan Automaton, Description of a Finite Automaton, Transition Systems, Properties of Transition Functions, Acceptability of a String by a Finite Automaton, Non Deterministic Finite State Machines, Equivalence of DFAand NDFA, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions, Finite automata with output (Moore and Mealy machines) and Inter conversion, Minimization ofFinite Automata (Construction ofMinimumAutomaton)

Unit II Regular Sets 8 Hrs

RegularExpressions, Transition System Containing∧-Moves, NDFas withMoves and Regular Expressions, Conversion of Non-deterministic Systems to Deterministic Systems, Algebraic Method using Arden'sTheorem, Construction off Finite Automata Equivalent to a Regular Expression, Equivalence ofTwoFiniteAutomata, Equivalence of TwoRegular Expressions

Unit III Regular and Context Free Grammars 8 Hrs

Regular Grammar: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA, Equivalence of RG (RLG and LLG) and FA. Pumping Lemma for Regular Sets, Application ofPumping Lemma.
Context Free Grammars: Leftmost, Rightmost derivations, Derivation Trees, Ambiguity in grammars and languages. Simplification of Context Free Grammars, Chomsky normal form (CNF), Greiback normal form (GNF), Pumping Lemma for Context Free Languages.

Unit IV PUSHDOWN AUTOMATA 8 Hrs

PUSHDOWN AUTOMATA: Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. Deterministic PDA. Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Unit V TURING MACHINES 8 Hrs

TURING MACHINES (TM): TuringMachineModel, Representation of TuringMachines (Instantaneous Descriptions, Table and Diagram), Language Acceptability by Turing Machines, Design of a Turing Machines, TM as accepters, and TM as a computer of integer functions, Types of TMs.

Unit VI Recursive and Recursively Enumerable Languages 8 Hrs

Recursive and Recursively Enumerable Languages: Properties of recursive and recursively enumerable languages, Decidability, Decidable Languages, Undecidable Languages, Halting Problem of Turing Machine, Universal Turing machine, Church Hypothesis, PostCorrespondenceProblem , Primitive Recursive Functions

Text Books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation
2. K. L. P. Mishra and N. Chandrasekaran, Theory of Computer Science: Automata Languages And Computation, PHI Publications

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra & Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013

4AD06 ARTIFICIAL INTELLIGENCE - LAB

Course Code: **4AD06**	**Artificial Intelligence Lab**	L-0,T-0,P-2,C-0
Course Prerequisite:	Basic knowledge of any Programming Language.The prerequisites for this course are data structures and algorithms. Proficiency in at least one programming language (e.g. R, Python, Java, . . .)	
Course Objectives:	This lab aims to introduce the basics of fact base programming and decision making. The lab introduces python/R/Java as language and tools for testing routines written during lab sessions.	
Course Outcomes (Expected Outcome):	On completion of the course, the students will be able to 1. Learn python/ R/ Java language . 2. Gain experience with the installation of Open Source product . 3. Hands on Experience on fact base programming and decision making programming .	

List of Experiments : This is a sample list of Experiments, minimum 10 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply) ï

1. Write a program to implement Breadth ï First Search.
2. Write a program to implement Depth ï First Search.
3. Write a program to implement TIC-TAC-TOE Game .
4. Write a program to implement 8 ï Puzzle problem.
5. Write a program to implement Water Jug Problem.
6. Write a program to implement Travelling Salesman Problem.
7. Write a program to implement Tower of Hanoi problem.
8. Write a program to implement Monkey Banana Problem.
9. Write a program to implement Missionaries ï cannibals Problem .
10. Write a program to implement N-queens Problem.

4AD07 OPERATING SYSTEM - LAB

4AD07	Operating System Lab	P-2, C-1

Course Prerequisite: Basic computer programming

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Operating System Lab by being able to do each of the following:
1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to
1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
a. Commands to view all executing, block and suspended process.
b. Command to check and change the priority of process CPU utilization for executing processes.
c. Commands to check for child process, sub-processes, process tree, abort & end process and all otherbasics commands related to processes
3. Write a program for multithreading using C.
4. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Preemptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement the FIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimal page replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and WorstFit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Bankers algorithm for deadlock avoidance
22. To implement following memory management techniques Implement MVT and MFT where memory block size is 100 for 5 processes. Enter no. of blocks for each processand calculate internal fragmentation.
23. To simulate LFU page replacement algorithms
24. To simulate the Single level directory file organization techniques.
25. To Simulate bankers algorithm for Dead Lock Avoidance (Bankerós Algorithm

4AD08 MICROCONTROLLER, SENSORS & ACTUATORS - LAB

4AD08	Microcontroller, Sensors & Actuators Lab	P-2, C-1

Course Prerequisite: Basic knowledge of Digital Circuits

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Microcontrollers, Sensors & Actuators by being able to do each of the following:

1. Explore microcontroller & its architecture
2. Assembly language Programming
3. Various Sensors & its interfacing
4. Different actuators & its interfacing

Course Outcomes (Expected Outcome):

On completion of the course, the students will be able to

1. Describe 8051 microcontroller and its architecture, also understand instruction processing
2. Design and Test assembly language programs using 8051 microcontroller instruction set
3. Explain concepts of serial & parallel data communication using 8051 microcontrollers
4. Illustrate and realize the Interfacing of memory, various I/O devices & Sensors with 8051 microcontroller
5. Implementing the Interfacing of actuators, relays, optoisolators & motors with 8051 microcontrollers

List of Experiments:

This is a sample list of Experiments; minimum 08 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
2. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
3. Write a program for multiplication of two 8-bits numbers.
4. Write a program for division of two 8-bits numbers
5. Write a program to check whether a given number is even or odd.
6. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
7. Write a program to check whether a given number is positive or negative.
8. Write a program to find greatest of two 8-bits signed &unsigned numbers.
9. Write program to configure ports as I/P or O/P & transfer data
10. Write a program to find square of a given number using lookup table
11. Write a program to generate square wave of 50% duty cycle using DAC
12. Write a program using timer of 8051
13. Write a program to on & off Led.
14. Write a program to rotate stepper motor at particular angle.
15. Write a program to interface LCD & display a character.
16. Write a program to Interface AD590 with 8051. (Beyond Syllabus)
17. Write a program to Interface ADC 0804 (Beyond Syllabus)

4AD09 C SKILL-LAB - II

Course Code:**4AD09** Course Title: **C Skill-Lab II** L-0,T-0,P-2,C-1

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to understand microcontrollers
2. To understand the infrastructure of Raspberry Pi and Arduino
3. To understand data and information processing techniques.
4. To understand to Design a program to solve the problems.
5. To be able to design sample programs.
6. To be able to design code of IOT.

Course Outcomes(Expected Outcome): **On completion of the course, the students will be able to**

1. Raspberry Pi and Arduino hardware/software
2. Commands in Raspberry Pi and Arduino
3. Basic operations of handling data
4. Code to perform string and numeric operations on given user input
5. Describe IOT(Internet of things).

List of Experiments : This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply) ï

1. Study Rasberry Pi and its component
2. Study Arduino and its component
3. Learn how to install Rasberry Pi
4. Learn configuration settings of Rasberry Pi
5. Start Raspberry Pi and learn the basics of editor and Raspberry Pi infrastructure
6. Start Raspberry Pi and try various Linux commands in command terminal window , Such as: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
7. Write a program to Read your name and print Hello message with name in python
8. Write a program to Read two numbers and perform all arithmetic operations in python
9. Write a program to do Word and character count of a given string in python
10. Write a program to calculate Area of a given shape (rectangle, triangle and circle) in python
11. Write a program in python to Print a name 'n' times, where name and n are read from standard input, using for and while loops.
12. Write a program in python to Handle Divided by Zero Exception.
13. Write a program in python to Print current time for 10 times with an interval of 10 seconds.
14. Write a program in python to Read a file line by line and print the word count of each line
15. Write a code to do LED blinking using Rasberry Pi .
16. Write a code in Java to do accessing of microcontrollers.
17. Write a code in Java to do accessing of microcontrollers.