ADIKAVI NANNAYA UNIVERSITY

B.Sc Under CBCS with effect from Academic Year 2019-2020

Subject: Artificial Intelligence & Robotics

Recommended Combination: BSc – Mathematics-Physics- Artificial Intelligence & Robotics

Eligibility: Intermediate MPC or equivalent course

Semester	Part	Subject	Hrs.	Credits	IA	ES	Total
FIRST YEAR							
SEMESTER I	I	Microprocessors and Microcontrollers	4	3	25	75	100
		Microprocessors and Microcontrollers Lab	2	2	0	50	50
SEMESTER II	II	Programming in C	4	3	25	75	100
		Programming in C Lab	2	2	0	50	50
SECOND YEAR							
SEMESTER III	III	Introduction to Artificial Intelligence & Python	4	3	25	75	100
		Python Lab	2	2	0	50	50
SEMESTER IV	IV	Introduction to Robotics	4	3	25	75	100
		Robotics-1 Lab	2	2	0	50	50
THIRD YEAR							
SEMESTER V	V	Data Warehousing & Data Mining	3	3	25	75	100
		Data Warehousing & Data Mining Lab	2	2	0	50	50
	VI	Computer Networks	3	3	25	75	100
		Computer Networks Lab	2	2	0	50	50
SEMESTER VI	**VII (A/B)**	**Elective-I**	3	3	25	75	100
		A. Artificial Intelligence					
		Artificial Intelligence-2 Lab					
		B .Robotics					
		Robotics-2 lab	2	2	0	50	50
	VIII ClusterA- 1,2,3 Or Cluster B- 1,2,3	**Elective-II(cluster A)**					
		1. Expert Systems+ Expert Systems Lab	3	3	25	75	100
		2. Fuzzy Logic + Fuzzy Logic Lab					
		3. Neural Network + Neural Network Lab					
		Lab	2	2	20	30	50
		Elective-II(cluster B)					
		1.Internet of Things + Internet of Things Lab	3	3	25	75	100
		2. Cloud Computing + Cloud Computing Lab					
		3.Embedded Systems + Embedded Systems Lab					
		Lab & Project	2	2	20	30	50

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I YEAR I SEMESTER

MICROPROCESSORS AND MICROCONTROLLERS

UNIT I : INTRODUCTION

Introduction to Microprocessor Architecture : Introduction and evolution of Microprocessors– Introduction to 8085, Architecture of 8086– Register Organization of 8086–Memory organization of 8086– General bus operation of 8086–Introduction to 80286–80386 and 80486 and Pentium.

Minimum and Maximum Mode Operations : Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycle timing diagrams.

UNIT II : ASSEMBLY LANGUAGE PROGRAMMING

Assembly Language Programming : Assembly Directives–Macro's– Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE Features– Addressing modes and Instruction set of 8051–Assembly language programming of 8051– Development systems and tools.

UNIT III : I/O INTERFACE

I/O Interface : 8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086– DMA controller (8257)– Architecture–Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259)–Command words and operating modes of 8259– Interfacing of 8259– Keyboard/display controller (8279)– Architecture–Modes of operation–Command words of 8279– Interfacing of 8279.

UNIT IV: INTRODUCTION TO 8051 MICRO CONTROLLER

Introduction to 8051 Micro Controller : Overview of 8051 Micro Controller– Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

UNIT V : CYBER PHYSICAL SYSTEMS AND INDUSTRIAL APPLICATIONS OF 8051

Cyber physical systems and industrial applications of 8051 : Applications of Micro Controllers– Interfacing 8051 to LED's–Push button– Relay's and Latch Connections– Keyboard Interfacing– Interfacing Seven Segment Display–ADC and DAC Interfacing.

Text Books:

- Micro Processor : B. Ram, Ramesh gayankar
- Micro Controller 8051: Mazidi

Reference Books:

- Digital Electronics : Anand Kumar
- Analog Electronics : Boylestad

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Micro Processor & Micro Controller Lab

List of Experiments

8086 Programs using kits MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Counters and Time Delay Peripherals and Interfacing Experiments
6. Traffic light control
7. Stepper motor control
8. Digital clock
9. A/D and D/A interface and Waveform Generation 8051
10. Basic arithmetic and Logical operations

Lab Requirements

Hardware: Microprocessor programs using Kits/ intel duel core

Software: MASM Simulation software

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I YEAR II SEMESTER

PROGRAMMING IN C
(common for B.Sc. Computers)

UNIT I

Introduction to Algorithms and Programming Languages: Algorithm - Key features of Algorithms - Some more Algorithms - Flow Charts - Pseudo code - Programming Languages - Generation of Programming Languages - Structured Programming Language- Design and Implementation of Correct, Efficient and Maintainable Programs.

Introduction to C: Introduction - Structure of C Program - Writing the first C Program - File used in C Program - Compiling and Executing C Programs - Using Comments - Keywords - Identifiers - Basic Data Types in C - Variables - Constants - I/O Statements in C- Operators in C- Programming Examples - Type Conversion and Type Casting

UNIT II

Decision Control and Looping Statements: Introduction to Decision Control Statements - Conditional Branching Statements - Iterative Statements - Nested Loops - Break and Continue Statement - Goto Statement

Functions: Introduction - using functions - Function declaration/ prototype - Function definition - function call - return statement - Passing parameters - Scope of variables - Storage Classes - Recursive functions - Type of recursion - Towers of Hanoi - Recursion vs Iteration

UNIT III

Arrays: Introduction - Declaration of Arrays - Accessing elements of the Array - Storing Values in Array - Calculating the length of the Array - Operations that can be performed on Array - one dimensional array for inter-function communication - Two dimensional Arrays - Operations on Two Dimensional Arrays - Two Dimensional Arrays for inter-function communication - Multidimensional Arrays - Sparse Matrices

Strings: Introduction -Suppressive Input - String Taxonomy - String Operations - Miscellaneous String and Character functions

UNIT IV

Pointers: Understanding Computer Memory - Introduction to Pointers - declaring Pointer Variables - Pointer Expressions and Pointer Arithmetic - Null Pointers - Generic Pointers - Passing Arguments to Functions using Pointer - Pointer and Arrays - Passing Array to Function - Difference between Array Name and Pointer - Pointers and Strings - Array of pointers - Pointer and 2D Arrays - Pointer and 3D Arrays - Function Pointers - Array Of Function Pointer - Pointers to Pointers - Memory Allocation in C Programs - Memory Usage - Dynamic Memory Allocation - Drawbacks of Pointers

Structure, Union, and Enumerated Data Types: Introduction - Nested Structures - Arrays of Structures - Structures and Functions - Self referential Structures - Union - Arrays of Unions Variables - Unions inside Structures - Enumerated Data Types

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UNIT V

Files: Introduction to Files - Using Files in C - Reading Data from Files - Writing Data from Files - Detecting the End-of-file - Error Handling during File Operations - Accepting Command Line Arguments - Functions for Selecting a Record Randomly - Remove() - Renaming a File - Creating a Temporary File

TEXT BOOK

1. Computer Fundamentals and Programming in C by REEMA THAREJA from OXFORD UNIVERSITY PRESS

REFERENCE BOOKS

1. E Balagurusamy: —COMPUTING FUNDAMENTALS & C PROGRAMMING! - Tata McGraw-Hill, Second Reprint 2008, ISBN 978-0-07-066909-3.
2. Ashok N Kamthane: Programming with ANSI and Turbo C, Pearson Edition Publ, 2002.
3. 2. Henry Mullish & Huubert L.Cooper: The Sprit of C, Jaico Pub. House,1996.

PROGRAMMING IN C LAB

1. Find out the perfect number using c program.
2. Write a C program to check whether a number is Armstrong or not.
3. Write a C program to find the sum of individual digits of a positive integer.
4. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
5. Write a C program to generate the first n terms of the sequence.
6. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
7. Write a C program to find both the largest and smallest number in a list of integers.
8. Write a C program that uses functions to perform the following:
    a. Addition of Two Matrices
    b. Multiplication of Two Matrices
9. Write a program to perform various string operations
10. Write C program that implements searching of given item in given list
11. Write a C program to sort a given list of integers in ascending order

Lab Requirements

Hardware: Desktop computer with latest configuration

Software: i) Turbo C/ Turbo C++ in windows OS

ii) Linux or Unix operating system with GCC

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II YEAR III SEMESTER

INTRODUCTION TO ARTIFICIAL INTELLIGENCE & PYTHON

UNIT – I:

Introduction: AI History, Intelligent Systems, Foundations of AI, Sub areas of AI, pplications. Problem Solving – State-Space Search and Control Strategies: Introduction, General Problem Solving, Characteristics of Problem, Exhaustive Searches, Heuristic Search Techniques, Iterative-Deepening A*, Constraint Satisfaction. Game Playing, Bounded Look-ahead Strategy and use of Evaluation Functions, Alpha-Beta Pruning

UNIT – II:

Logic Concepts and Logic Programming: Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in Propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT-III:

Machine-Learning Paradigms: Introduction. Machine Learning Systems. Supervised and Unsupervised Learning. Inductive Learning. Learning Decision Trees (Text Book 2), Deductive Learning. Clustering, Support Vector Machines. Artificial Neural Networks: Introduction, Artificial Neural Networks, Single-Layer Feed Forward Networks, Multi-Layer Feed-Forward Networks, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks.

UNIT-IV: Python

Introduction : History of python, Need of Python Programming, Applications Basics of Python, Programming using the REPL (Shell), Running Python Scripts, Variables, Assignment, Keywords, Input/output, Indentation – Types, Operators and Expressions : Types, Strings, Boolean, Operators – Arithmetic Operators, Comparison , Assignment Operators, Logical Operators, Bitwise Operators, Member ship operators, Identity Operators

UNIT-V:

Expressions- Control Structures & Functions: Expressions and order of Evaluations, Control Flow-if, if-else, for, while, break, continue, Functions – Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Returning values), Scope of variables in a function – Global and Local variables.

Text books:

Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011

Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004

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Reference books:

Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.

Introduction to Artificial Intelligence by Eugene Charniak, Pearson.

Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.

Artificial Intelligence by George Fluger rearson fifth edition.

Python Lab

1. Python program to Add two numbers
2. Python program for factorial of a number
3. Python program for simple interest
4. Python program for compound interest
5. Python program to check Arm Strong Number
6. Python program for Program to find area of a circle
7. Python program to print all Prime numbers in an interval
8. Python program to check whether a number if Prime or not
9. Python program for n-th Fibonacci number
10. Python program for Fibonacci numbers

Lab Requirements

Hardware: Desktop computer with latest configuration
Software: i) Windows or Linux desktop OS
ii) Python 2.7x/ 3.6x

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II YEAR IV SEMESTER

INTRODUCTION TO ROBOTICS

UNIT I : INTRODUCTION

Robot definition, Robotics and programmable automation Historical background, laws of Robotics. Robotics systems and Robot anatomy, specification of Robots. Robot geometrical configuration.

UNIT II : MATHEMATICS FOR ROBOT MANIPULATION

Homogeneous coordinate transformations, Mathematical description of objects. Description of a wedge by transformation matrices, Relative transformations in the robot workspace. Description of manipulator joints, Assignment of coordinate systems to robot joint and derivation of transformation matrices.

UNIT III : ROBOT AND END EFFECTORS

Introduction, classification of end effectors, Types of Grippers Hooks, scoops and other devices, Gripper force analysis and design of Drive system for gripper.

UNIT IV : COORDINATE SYSTEMS IN ROBOT APPLICATIONS

Euler angles for specifying orientation, Euler angles for roll-yaw-roll geometry, Gripper positioning by Euler angles for roll-yaw-roll geometry - Euler angles for roll - pitch - yaw geometry, Cylindrical Robot coordinates polar Robot coordinates, calculation of cylindrical, polar coordinates some applications.

UNIT V : ROBOT LANGUAGES AND PROGRAMMING

Programming – powered, manual. Textual robo languages – first generation, second, future generation – VAL, VAL II, simple programming – exercises.

Text Books:

1. Francis N. Nagy,Andras Siegler, Engineering Foundation of Robotics, Prentice Hall, 1987
2. Richard D. Klafter, Thomas A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Prentice Hall,1989
3. P.A.Janaki Raman, Robotics and Image Processing an Introduction, Tata Mc Graw Hill Publishing company

Reference Books:

1. S.R. Deb, Robotics Technology and flexible automation, Tata Mc Graw Hill Publishing company Ltd.,1994

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Robotics -1 Lab

- Introduction to Microprocessor
- Control of Drives using Microprocessor Kit
- Sequencing circuits in hydraulic/pneumatics
- Synchronizing circuits in hydraulics/pneumaits
- Introduction to PLC
- PLC Programming
- PLC Ladder diagram
- Interfacing with computers

Lab Requirements

Hardware: Intel i3

Software: PLC Software

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Lab Requirements for BSc (MPAIR)

I Year (I Semester)

1.Microprocessor & Microcontroller Lab:

Hardware: Microprocessor programs using Kits/ intel duel core

Software: MASM Simulation software

I Year (II Semester)

2.Programming in C Lab

Hardware: Desktop computer with latest configuration

Software: i) Turbo C/ Turbo C++ in windows OS

ii) Linux or Unix operating system with GCC

II Year (III Semester)

3.Python Programming Lab

Hardware: Desktop computer with latest configuration

Software: i) Windows or Linux desktop OS

ii) Python 2.7x/ 3.6x

II Year (IV Semester)

4.Automation (Robotics) Lab

Hardware: Intel i3

Software: PLC Software

Note: Computer to student ratio must be 1:1 always.