GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: MICROPROCESSOR & CONTROL SYSTEM COMPONENTS
(COURSE CODE: 3350904)

Diploma Programmes in which this course is offered	Semester in which offered
Electrical Engineering	5th Semester

1.   RATIONALE

In modern process industries and power stations use of microprocessor, microcontroller, PLC is very common, in order to control, monitor and process various parameters and data. Industry need highly skilled manpower in this field. Essential efforts are being made to develop required skills in the students by this course.

2.   COMPETENCY

The course content should be taught and implemented with the aim to achieve different types of skills leading to achieve the following competencies.
- Use and maintain different industrial applications based on microprocessor, microcontroller and PLC.

3.   Course Outcomes:

The students will be able to:
- Understand basics of control system, micro processors, microcontrollers and PLC.
- Apply microprocessor, microcontroller and PLC in industrial applications.

4.   Teaching and Examination Scheme

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
4	0	2	6	70	30	30	20	150

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit **ESE** - End Semester Examination; **PA** - Progressive Assessment.

5.   COURSE DETAILS

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit – I. Control Systems	1a. Explain types of control systems	1.1 Introduction 1.2 Role of control system in instrumentation 1.3 Open loop and close loop control system 1.4 Block diagram of open loop control system 1.5 Types of open loop control system 1.6 Block diagram of close loop control system 1.7 Types of close loop control system 1.8 Comparison between open loop and close loop control system
	1b. Explain servomechanism & regulator circuits 1c. Describe basic control actions 1d. Explain basic control components	1.9 Servomechanism and regulators with suitable examples 1.10 On-off type control, Proportional control, Derivative control, Integral control, Proportional derivative (PD) control, Proportional integral (PI) control, PID control 1.11 Introduction to basic control components – (a) AC/ DC Servo motor (b) AC/ DC Tacho generator (c) Stepper motor (d) Synchro

Unit	Major Learning Outcomes	Topics and Sub-topics
Unit-II Basics of Microprocessor	2a. Explain fundamentals of microprocessors 2b. Explain microprocessor architecture 2c. Apply basic microprocessor programming	2.1 Introduction to microprocessor 2.2 Advantages and disadvantages of microprocessor control over traditional control 2.3 Structure of micro processor 2.4 Generalized architecture of microprocessor 2.5 Functions of each block 2.6 Lumped and distributed digital control and their block diagram 2.7 Functional block diagram of 8085 microprocessor with pin diagram 2.8 logical block diagram of 8085 microprocessor-Registers, ALU, Decoder, Serial control section, Interrupt section, timing and control section 2.9 Programming Model of 8085 2.10 Addressing Modes 2.11 Instruction classification, Instruction format 2.12 Basic Assembly Language programming (only simple arithmetic operations-addition, subtraction)
Unit-III Applications of Microprocessor	3a. Describe types of memories 3b. Interfacing of microprocessor with memory 3c. Simple applications of microprocessor	3.1 Different types of memories (ROM, RAM, PROM, EPROM,EEPROM) 3.2 Schematic diagram of memory chips decoder, memory interfacing. 3.3 Memory I/O data transfer scheme for 8255. 3.4 Interfacing of switches and L E D s 3.5 . Simple applications of microprocessor (block diagram level, without programming) of 3.5.1 Temperature control of furnace using micro processor 3.5.2 Traffic light control. 3.5.3 SCR firing angle control 3.5.4 Data acquisition system
Unit-IV Basics of Microcontroller 8051	4a. Explain 8051 architecture 4b. Use 8051 connections, I/O ports and memory organization	4.1 Comparison between microcontrollers and microprocessors 4.2 Block diagram & pin diagram of 8051 microcontroller 4.3 Internal RAM, ROM and Special function Registers in 8051 4.4 I/O ports 4.5 Interfacing with external memory 4.6 Counters and Timers
Unit-V Programmable Logic Controller & SCADA	5a. Explain basics of PLC 5b. Describe SCADA	5.1 Introduction 5.2 Advantages & disadvantages 5.3 Basic blocks like CPU, I/O modules, bus system, power supplies & remote I/Os 5.4 Overview of different PLC's available in market 5.5 Selecting a PLC 5.6 SCADA- Introduction, Block diagram, Application

6.   SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Control Systems	10	02	04	04	12
II	Basics of Microprocessor	12	04	04	04	16
III	Applications of Microprocessor	12	02	04	06	15
IV	Basics of Microcontroller 8051	12	02	04	06	15
V	Programmable Logic Controller & SCADA	10	04	02	04	12
Total		**56**	**14**	**18**	**24**	**70**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

7.   SUGGESTED LIST OF EXERCISES/PRACTICALS
The practical/exercises should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills (**Outcomes in cognitive, psychomotor and affective domain**) so that students are able to acquire the competencies. Following is the list of practical exercises for guidance.

Sr. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Hrs. required
1	I	Control angular displacement using Synchro.	2
2	I	Control and regulate speed of DC motor using tacho generator.	2
3	II	Develop assembly language program for arithmetic addition of two numbers using µP 8085 kit.	2
4	II	Develop assembly language program for arithmetic subtraction of two numbers using µP 8085 kit.	2
5	II	Develop assembly language program for arithmetic multiplication of two numbers using µP 8085 kit.	2
6	III	Interface programmable device like 8255 with µP 8085	2
7	III	Interface switches and LEDs using µP 8085	2
8	III	Control temperature using the 8085 application module	2
9	III	Use µP 8085 for SCR firing control.	2
10	III	Control Traffic light using µP 8085	2
11	IV	Interface of seven segment LED display using 8051 kit.	2
12	IV	Interface of LCD display using 8051 kit.	2
13	**IV**	Control speed of stepper motor using 8051 kit.	2
14	V	Use arithmetic function of PLC for a typical application.	2
15	V	Use timer function of PLC for a typical application.	2
		Total	**30**

8.   SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like: course/topic based seminars, internet based assignments, teacher guided self learning activities, course/library/internet/lab based mini-projects---etc.

1. Identify and select various trainer kits for control system applications.
2. Identify and interface various attachments/ accessories with microprocessor and microcontroller as mini project.
3. Prepare flow chart and assembly language programming for basic arithmetic applications for 8085 microprocessor.

9.   SPECIAL INSTRUCTIONAL STRATEGIES (if any)

Industrial visit of process industries.

10.   SUGGESTED LEARNING RESOURCES

A)   List of Books

Sr. No.	Title of Book	Author	Publication
1.	Microprocessor Architecture, Programming and Applications with the 8085	Ramesh S. Gaonkar	Penram International Publishing (India)
2.	Fundamentals of Microprocessors, Microcontrollers & Microcomputers	B.Ram	Dhanpatrai and Sons
3.	Microprocessors & Interfacing Programming and Hardware	Douglass V. Hall	TMH publication
4.	The 8051 Microcontroller ARCHITECTURE, PROGRAMMING & APPLICATIONS	Kenneth J. Ayala	Penram International Publishing (I) Pvt. Ltd.
5.	The 8051 Microcontroller & Embedded Systems using Assembley and C	Muhamad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinleay	Pearson
6.	Webb, John W.,Reis, Ronald A.	Programmable Logic Controllers And Applications	Prentice Hall of India
7.	I J Nagarath, M. Gopal	Control Systems Engineering	New Age Publishers

B)   List of Major Equipment/ Instrument with Broad Specifications

1. Trainer kit of speed control and speed regulation of DC motor using Techo Generator.
2. Trainer kit of Synchro transmitter and receiver.
3. Microprocessor 8085 kit with necessary accessories.
4. 8255 interfacing kit.
5. Microcontroller 8051 kit with necessary accessories.
6. Kit for add on cards for performing different applications of PLC.
7. Add on cards for interfacing different types of inputs and out puts.
8. Power supply for above kits and applications.

C)   **List of Software/Learning Websites**

Searching engine could be used to locate textile related sites

    A. www.**keil**.com/
    B. **www.allaboutcircuits.com**
    C. **www.nmbtc.com**
    D. **http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/Course_home1_1.htm**

11.   **COURSE CURRICULUM DEVELOPMENT COMMITTEE**
       Faculty Members from Polytechnics

- **Prof. J C Gadani Lecturer in Electrical Engg, C U Shah Polytechnic, Surendranagar.**
- **Prof. B R Shrotriya, Lecturer in Electrical Engg, Government Polytechnic, Ahmedabad.**
- **Prof. H. I. Joshi, Lecturer in Electrical Engg, Government Polytechnic, Ahmedabad.**
- **Prof. K. K. Kansara,Lecturer in Electrical Engg, NMGPI Ranpur.**

    Coordinator and Faculty Members from NITTTR Bhopal
- **Prof. (Mrs.) Susan S. Mathew**
- **Dr. Joshua Earnest**,