COURSE TITLE : MINI PROJECT
COURSE CODE : 4009
COURSE CATEGORY : A
DAYS / SEMESTER : 5 DAYS (35 periods)/4
CREDITS : 5

General Outcome:

GO	On completion of the study of this course the students will be able:
1	To create an Industrial environment and culture within the institution.
2	To set up production lab utilizing the infrastructure of the institution.
3	To standardize laboratories to industrial standard, thereby giving exposure to industrial housekeeping standards.
4	To provide students hands on experience on, troubleshooting, maintenance, fabrication, innovation, record keeping, documentation etc thereby enhancing the skill and competency part of technical education.
5	To promote the concept of entrepreneurship.
6	To inculcate innovative thinking and thereby preparing students for main project.
7	To set up self maintenance cell within departments to ensure optimal usage of infrastructure facilities.

Guidelines:

The mini project can be organized into three phases based on the recommendations and evaluation criteria listed below.

Phase1: Standardization of Laboratories

This phase of the mini project can be clubbed with laboratory hours of the semester. Before the commencement of cycle of experiments for the semester, the students should be given instructions on 5S method of industrial housekeeping. Video resources available in the internet can be utilized for the purpose. After the initial summarizing, students should be grouped into batches of 5 and should be entrusted with activities of implementing or maintaining 5S standardization of the laboratory. This ensures that all experiments of the laboratory are performed as per industrial standard.

To elaborate the concept of standardization let us consider a typical case of machine shop. The case can suitably be adopted for any departments as standardization concept is the same for all industry, whether it is manufacturing, service or hospitality.

Case study: Standardization of Machine shop of Mechanical Department.

The machine shop is like any other shop floor, and thus it needs to be organized for convenience and safety. Special dedicated team should be formed for sorting, organizing, and sustaining the organized

work culture at the machine shop. The 5S Team works on the 5 Japanese principles of organization, which have been successfully implemented at various shop floors around the world. The 5 pillars of organization that we aim at are:

Sort (Seiri)

Sort means that you remove all items from the workplace that are not needed for current machine shop activities. This essentially involves segregating items of immediate use from items that are not needed.

Set in Order (Seiton)

Setting in order whatever has been "Sorted." Labeling and marking down required items of usage. Creating designated areas for frequently used tools and arranging them so that they are easy to find.

Shine (Seiso)

Cleaning up after the work is over. Putting tools and used materials back in their designated places, the way they were "Set in order." Cleaning and sweeping the workplaces, so as to avoid any hazardous materials spills and other accidents at the workplace.

Standardize (Seiketsu)

Standardize whatever has been achieved so far using the first three pillars. Making it a part of the daily routine and setting aside time to sort, set in order, and shine repeatedly.

Sustain (Shitsuke)

Sustaining is maintaining the clean and organized work environment over a long period of time to enhance productivity.

Once the first two pillars are implemented during the initial sessions of the laboratory, third to fifth pillars should be made a regular activity before commencement of any laboratory work and after concluding any days work and should be monitored. The same criteria can be adopted for any laboratory, irrespective of the programme.

Evaluation of Phase1

This part of the mini project carries 30% of the total marks. The evaluation should be made as group performance in implementing the standardization and individual contribution in setting work place clean and tidy. Evaluations by way of surprise visits made by the Head of Department and Guide during laboratory hours at least twice the semester contribute to the part of total marks.

Phase2: Identifying and solving real time issues

This part of the mini project contributes to 50% of the evaluation criteria. Here the students are encouraged to find out and propose solution to real time problems they observe within the institution or pertaining to the community. Here it is intended to give students exposure to real time problems that

may occur in industry or in real life environments. Their ability to identify and solve problems based on the skills achieved so far is invoked here. It is recommended to identify and solve problems which demand effort that can be completed within the stipulated timing and does not involve complicated designing or programming. Mini projects can be a gate way to final academic projects and if any of the identified problem demands more time and effort, such cases may be carried over to as main project. All safety precautions mandate to the industry should be strictly followed during implementation of the mini project. Safety mentioned here includes both the safety of the student as well as safety of the user to the machine.

Let us consider a real time case study to elaborate the concept. The case is so selected in this context that, irrespective of the program of study, any department can take up the issue and propose a solution.

Case study: DLP projectors installed in our class rooms are developing one of the following problems.

- Projector not showing display.
- Images appearing on tints of a single shade.
- Patches of dots initially appearing on the screen and gradually spreads to the entire screen.

Solution:

1. Projector not showing display.
    - Check ac mains with a multi meter. Students should be given instructions in handling AC mains for safety. If the problem is with the electrical wiring, rectify the problem. Otherwise
    - Check mains cord for continuity. Students should be instructed to use multi meter for the purpose. Otherwise
    - Suspect problem with the power supply. Refer to instruction manual, internet resources or video resources available in the YouTube.
    - Since modern equipments are coming with advanced casings, usually without any screws, any improper attempt to dismantle the casing can result in permanent damage of the equipment. The students should refer to step by step procedure available in you tube before attempting.
2. Images appearing on tints of a single shade.
    - Search internet forums for similar cases.
    - Upon goggling, searching, it is identified that the problem is with missing one of R G B connections of VGA cable.
    - Attempt repairing the cable. If not replace the cable.
    - If not problem with the cable, check projector logical board for problem.
    - It is to be noted that merely replacing the cable will not solve the problem for ever. Students should be encouraged to find the cause for the cable failure. Simply

replacing the cable without solving the cause can definitely end up in repetition of the problem. In this typical case, the cables are often damaged by keeping the loose end of the cable on the floor there by walked over by commuters. The loose end should be properly tied using cable ties so that the loose end does not fall over.

3. Patches of dots initially appearing on the screen and gradually spreads to the entire screen.
    - Clean the lens for any residue. Try zooming the lens if the dots move along with axis of rotation, dirt or residue on lens is suspected. If not
    - Check internet forum for solution. Upon goggling, you will find that the problem can be with DLP panel and need a replacement.
    - The students should be encouraged to find the reason for the failure. Internet forum suggests dampness from roof or improper shut down that accounts for DLP failure.

Case studies of similar nature impart skill and competency part into the programme.

Students as individual or a team of 2 may be entrusted with providing solution to similar problems. Cases like ceiling leakage or dampness problem of a building in case of civil engineering, trouble shooting a computer network, resource sharing through network within the institution for computer engineering students can be considered as part of the mini project. Fabrication of test jigs for electronics etc.

It is also encouraged to run production centers or running subassembly units of nearby industries within the campus are also encouraged.

Phase3: Documentation

Documentation accounts for 20% of the total evaluation. Students are required to submit detailed project report of the entire semester work of mini project. They should be encouraged to make use of documentation tools like Latex for preparation of the report.

Innovative ideas of commercial values should be encouraged to be continued as main project for the forth coming semester.

<table>
<tr><td colspan="4">Evaluation</td></tr>
<tr><td colspan="2">Standardization (30%)</td><td rowspan="2">Problem identification and solving (50%)
or collaborative work (50%)
or involvement in production centre (50%)</td><td rowspan="2">Documentation (20%)</td></tr>
<tr><td>Group (15%)</td><td>Individual (15%)</td></tr>
</table>

COURSE TITLE : ELECTRONICS INSTRUMENTS AND MEASUREMENTS
COURSE CODE : 4041
COURSE CATEGORY : A
PERIODS/WEEK : 4
PERIODS/SEMESTER : 56/4
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Analog and digital meters	14
2	Analog and digital osciloscopes, transducers	14
3	Bridges and signal analysers	14
4	Data recorders and DAS	14
	TOTAL	**56**

Course General Outcome :

Module	GO	On completion of the study of this course the students will be able:
1	1	To understand the performance of various measuring instruments.
	2	To understand working and use of analog and digital multimeters.
2	3	To understand working and use of analog and digital oscilloscope.
	4	To understand different types of transducers, sensors and its applications.
3	5	To understand various AC and DC bridges.
	6	To understand the working of function generators and signal generators.
4	7	To understand various types of data recorders.
	8	To understand the basics of data acquisition system.

GO - General Outcome

On the completion of the study the student will be able :

MODULE I ANALOG AND DIGITAL MULTIMETERS

1.1.0 To understand the performance of various measuring instruments.

1.1.1 To define instrument accuracy, precision, sensitivity, resolution and error.
1.1.2 To explain the working of galvanometer.
1.1.3 To explain the conversion of galvanometer into voltmeter and ammeter.
1.1.4 To list the differences between moving coil and moving iron instruments.

1.2.0 To understand working and use of analog and digital multimeters.

1.2.1 To explain the block diagram of Analog Multimeter.
1.2.2 To explain how Galvanometer is converted into Multimeter.
1.2.3 To list the specifications of Analog Multimeter .
1.2.4 To explain how the Analog Multimeter to measure different values of resistances.
1.2.5 To explain the DC voltage and DC Current Measuring circuit in Analog Multimeter.
1.2.6 To explain the AC voltage and AC Current Measuring Circuit in Analog Multimeter.
1.2.7 To explain the Block Diagram of Digital Frequency Meter.
1.2.8 To list the specifications of Digital Multimeter.
1.2.9 To explain Block Diagram Digital Multimeter.
1.2.10 To differentiate 3 ½ and 4 ½ digit displays in terms of accuracy.

MODULE II ANALOG AND DIGITAL OSCILOSCOPES, TRANSDUCERS.

2.1.0 To understand working and use of analog and digital oscilloscope.

2.1.1 To list the applications of CRO.
2.1.2 To explain the functional block diagram of a CRO.
2.1.3 To explain CRT with neat sketch.
2.1.4 To explain electrostatic focusing and deflection system used in CRT. .To state the deflection sensitivity.
2.1.5 To describe different types of CRO probes.
2.1.6 To describe the procedures of measuring voltage (DC and AC), frequency, phase. Angle and time period using CRO.
2.1.7 To differentiate between dual beam and dual trace CROs.
2.1.8 To explain the working of digital storage oscilloscope.

2.2.0 To understand different types of transducers, sensors and its applications.

2.2.1 To list the classification of transducers.
2.2.2 To describe different types of resistive transducers - potentiometric, strain gauge and thermistors.
2.2.3 To explain the working principle of capacitive transducers.
2.2.4 To explain the working principle of microphone type transducer.
2.2.5 To explain the working principle of LVDT.
2.2.6 To explain the principle of thermocouple, thermopile and opto coupler.
2.2.7 To explain the features of photo voltaic cell with application and examples.

2.2.8 To describe sensors and actuators, different switches, relays, proximity switches, hall effect sensor and fiber-optic sensor.

MODULE III BRIDGES AND SIGNAL ANALYSERS.

3.1.0 To understand various AC and DC bridges.

3.1.1 To explain resistance measurement using Wheatstone bridge.
3.1.2 To explain the principle of impedance measurement using Hay's bridge.
3.1.3 To explain the principle of impedance measurement using Maxwell's bridge.
3.1.4 To explain the principle of impedance measurement using Schering's bridge.
3.1.5 To describe the principle of measuring frequency using Wien bridge.

3.2.0 To understand the working of function generators and signal generators.

3.2.1 To explain the block diagram of function generator.
3.2.2 To explain the principle and block diagram of a spectrum analyzer.
3.2.3 To list the applications of spectrum analyzer.
3.2.4 To explain the block diagram of logic analyzer.
3.2.5 To list the applications of logic analyzer.
3.2.6 To explain the principle of Q-meter.

MODULE IV DATA RECORDERS AND DAS

4.1.0 To understand various types of data recorders.

4.1.1 To understand the principle of data recorders.
4.1.2 To explain the working of potentiometer type recorders.
4.1.3 To explain the working of X-Y recorders, and strip chart recorders.
4.1.4 To compare different types of data recorders.

4.2.0 To understand the basics of data acquisition system.

4.2.1 To explain the block diagram of basic instrumentation systems.
4.2.2 To differentiate open loop and closed loop control systems.
4.2.3 To list different types of DAS.
4.2.4 To explain the block diagram of analog DAS.
4.2.5 To explain the block diagram of digital DAS.
4.2.6 To describe the role of telemetry in instrumentation system.

CONTENT DETAILS

MODULE I Analog and Digital Multimeters

Terminologies in measurements - accuracy - precision - sensitivity - resolution - error - galvanometer - working - conversion of galvanometer into voltmeter and ammeter - differences between moving coil and moving iron instruments - analog multimeter - block diagram - use of galvanometer as multimeter - measuring circuit for measurement of resistance, dc current, dc voltage, ac current and ac voltage - specifications - digital frequency meter - digital multimeter - block diagram - difference between 3 ½ and 4 ½ digit displays in terms of accuracy.

MODULE II Analog and Digital Osciloscopes, Transducers

CRO - applications - functional block diagram, CRT - construction - electrostatic focusing and deflection system - deflection sensitivity - types of CRO probes - measurement of voltage (DC and AC), frequency, phase angle and time period with CRO - difference between dual beam and dual trace CROs - digital storage oscilloscope - block diagram - working principle - transducers - classification - primary and secondary - active and passive, types of resistive transducers - potentiometric, strain gauge and thermistors, capacitive transducers ,microphone type transducer, LVDT, thermocouple, thermopile, opto coupler - working principle - photo voltaic cell - features - application - examples - sensors - actuators - different switches - relays - proximity switches - hall effect sensor - fiber-optic sensor.

MODULE III Bridges and Signal Analysers

Wheatstone bridge - Hay's bridge - Maxwell's bridge - Schering's bridge - impedance measurement - Wien bridge - frequency measurement - function generator - block diagram - spectrum analyzer - principle - block diagram - applications - logic analyzer - block diagram - applications - Q-meter - working principle

MODULE IV Data Recorders and DAS

Data recorders - potentiometer type recorders - X-Y recorders - strip chart recorders - working principle - comparison - basic instrumentation systems - block diagram - difference between open loop and closed loop control systems - types of DAS - analog DAS - digital DAS - block diagram - role of telemetry in instrumentation system

Text Book

1. Electronic Instrumentation - H S Kalsi - Third edition.
2. Electronics and Electrical Measurements and Instrumentation - J B Gupta - S K Kataria.
3. A Course in Electrical and Electronic Measurements and Instrumentation - A K Sawhney.
4. Industrial Electronics and Control - Biswanath Paul.

COURSE TITLE : LINEAR INTEGRATED CIRCUITS
COURSE CODE : 4042
COURSE CATEGORY : B
PERIODS PER WEEK : 4
PERIODS PER SEMESTER : 56
CREDITS : 4

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Study of Operational Amplifiers	14
2	Application of Operational Amplifier	14
3	PLL and Timers	14
4	IC Regulators and SMPS	14
TOTAL		**56**

Course General Outcome:

MODULE	GO	ON COMPLETION OF THE STUDY OF THIS COURSE THE STUDENTS WILL BE ABLE :
1	1	To comprehend the working of operational amplifier
2	2	To understand the applications of operational amplifier
3	3	To comprehend the working of PLL
	4	To understand the working of 555 timer
4	5	To understand the working of various IC voltage regulators
	6	To understand the working of SMPS

GO - General Outcome

On the completion of the study the student will be able:

MODULE I STUDY OF OPERATIONAL AMPLIFIERS

1.1.0 To understand the working of operational amplifier

1.1.1 To explain the block diagram of general purpose operational amplifier
1.1.2 To explain the working of differential amplifier basic circuit
1.1.3 To discuss different package types and pin configuration of operational amplifier
1.1.4 To identify different manufacturer's designations for linear ICs
1.1.5 To explain the concept of virtual ground
1.1.6 To define different electrical parameters of operational amplifier
1.1.7 To list the characteristics of an ideal operational amplifier
1.1.8 To explain the working of inverting amplifier
1.1.9 To derive the expression for voltage gain of the inverting amplifier
1.1.10 To explain the working of non-inverting amplifier
1.1.11 To derive the expression for voltage gain of the non inverting amplifier
1.1.12 To explain the working of voltage follower

MODULE II APPLICATION OF OPERATIONAL AMPLIFIER

2.1.0 To understand the applications of operational amplifier

- 2.1.1 To explain the working of summing amplifier, difference amplifier and adder-subtractor circuit
- 2.1.2 To explain the working of instrumentation amplifier
- 2.1.3 To explain V to I and I to V converters
- 2.1.4 To explain the working of comparators, zero crossing detector and schmitt trigger circuits
- 2.1.5 To explain the working of precision diode, half wave and full wave precision rectifiers
- 2.1.6 To explain the working of peak detector
- 2.1.7 To explain the working of Integrator and differentiator
- 2.1.8 To explain the working of RC phase shift oscillator and Wein bridge oscillator circuits
- 2.1.9 To explain the working of Astable multivibrator, Monostable multivibrator and Schmitt trigger
- 2.1.10 To explain the working of Triangular wave generator circuit
- 2.1.11 To explain first order active low pass and high pass Butterworth filters

MODULE III PLL AND TIMERS

3.1.0 To comprehend the working of PLL

- 3.1.1 To explain the general block diagram of PLL
- 3.1.2 To define capture range lock-in range, and pull-in time of PLL
- 3.1.3 To explain the block diagram of NE/ SE 566 Voltage Controlled Oscillator
- 3.1.4 To list the important electrical characteristics of the 565 PLL
- 3.1.5 To explain the functional block diagram of PLL NE/ SE 565
- 3.1.6 To describe the applications of PLL as frequency multiplier and FM demodulator

3.2.0 To understand the working of 555 timer

- 3.2.1 To list the features of 555 timer
- 3.2.2 To explain the functional block diagram of 555 timer
- 3.2.3 To explain the working of astable and monostable circuits using 555 timer
- 3.2.4 To write the expression for time period of astable and monostable circuits using 555
- 3.2.5 To describe LM 380 audio power amplifier

MODULE IV IC REGULATORS AND SMPS

4.1.0 To understand the working of various IC voltage regulators

- 4.1.1 To list the features of IC regulators
- 4.1.2 To describe the operation of 3 terminal fixed voltage regulator IC's
- 4.1.3 To explain typical circuits of LM 78XX and LM 79XX
- 4.1.4 To explain the operation of adjustable voltage regulator LM 317
- 4.1.5 To explain dual power supply using LM 320 and LM 340
- 4.1.6 To list the important features of LM 723 voltage regulator
- 4.1.7 To explain the functional block diagram of LM 723
- 4.1.8 To explain the basic low voltage and high voltage regulator circuits using LM 723

4.2.0 To understand the working of SMPS

- 4.2.1 To explain the block diagram of SMPS
- 4.2.2 To list the advantages and disadvantages of SMPS
- 4.2.3 To explain the working principle of opto-couplers
- 4.2.4 To describe the opto-coupler IC 4N35

CONTENT DETAILS

MODULE I STUDY OF OPERATIONAL AMPLIFIERS

Block diagram of general purpose operational amplifier - differential amplifier - op-amp symbol - package types - pin configuration - manufacturer's identifying initials and designations for linear ICs - concept of virtual ground - electrical parameters of op-amp - characteristics of an ideal op-amp - inverting amplifier and non inverting amplifier - expression for voltage gain - voltage follower

MODULE II APPLICATION OF OPERATIONAL AMPLIFIER

Summing amplifier - difference amplifier - adder - subtractor - instrumentation amplifier - V to I and I to V converters - comparators - zero crossing detector - schmitt trigger - precision diode - half wave precision rectifier - full wave precision rectifier - peak detector - integrator - differentiator - RC phase shift oscillator - Wein bridge oscillator - astable multivibrator - monostable multivibrator - schmitt trigger - triangular wave generator - first order active low pass and high pass Butterworth filters

MODULE III PLL AND TIMERS

General block diagram of PLL - capture range, lock range, and pull in time - block diagram of VCO NE / SE 566 - electrical characteristics of 565 PLL - functional block diagram of PLL NE / SE 565 - applications of PLL as frequency multiplier and FM demodulator - features of 555 timer - functional block diagram of 555 timer - astable and monostable circuits using 555 timer - expression for time period - LM 380 audio power amplifier

MODULE IV IC REGULATORS AND SMPS

Features of IC regulators - three terminal fixed voltage regulator IC's - typical circuits of LM 78XX and LM 79XX - adjustable voltage regulator LM 317 - dual power supply using LM 320 and LM 340 - features of LM 723 voltage regulator - functional block diagram of LM 723 - basic low voltage and high voltage regulator circuits using LM723 - block diagram of SMPS - advantages and disadvantages - opto-couplers - principle of operation - IC 4N35

TEXT BOOK

1. D Roy Choudhury and Shail B Jain - Linear Integrated Circuits - New Age International Publishers- 4th Edition

2. Ramakant A Gayakwad - Op-Amps and Linear Integrated Circuits - PHI- 4th Edition

REFERENCE

1. B Visvesvara Rao – Linear Integrated Circuits - Pearson.

2. K R Botkar - Integrated Circuits - Khanna Publishers.

COURSE TITLE : MICROCONTROLLER AND INTERFACING
COURSE CODE : 4043
COURSE CATEGORY : A
PERIODS/WEEK : 5
PERIODS/SEMESTER : 70
CREDITS : 5

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Introduction to 8051 microcontroller	18
2	Assembly language programming and interrupts	18
3	Timers, serial communication	17
4	Interfacing of 8051	17
TOTAL		**70**

Course General Outcome:

MODULE	GO	ON COMPLETION OF THE STUDY OF THIS COURSE THE STUDENTS WILL BE ABLE :
1	1	To understand the architecture of 8051 microcontroller
2	2	To understand assembly language programming
	3	To understand interrupt processing in 8051
3	4	To understand the working of timers
	5	To understand serial communication
4	6	To understand interfacing of 8051

GO - General Outcome

On the completion of the study the student will be able:

MODULE I INTRODUCTION TO 8051 MICROCONTROLLER

1.1.0 To understand the architecture of 8051 microcontroller

1.1.1 To compare microprocessor and microcontroller
1.1.2 To list the features of 8051
1.1.3 To explain the internal architecture of 8051 microcontroller
1.1.4 To describe the pin functions of 8051 microcontroller
1.1.5 To compare different versions from 8031 to 8051
1.1.6 To explain the data memory organization in 8051
1.1.7 To explain the program memory organization in 8051
1.1.8 To describe the architecture of ports in 8051

MODULE II ASSEMBLY LANGUAGE PROGRAMMING AND INTERRUPTS

2.1.0 To explain assembly language programming

- 2.1.1 To explain the addressing modes of 8051
- 2.1.2 To explain the instruction set of 8051
- 2.1.3 To write simple programs with 8051 (program for addition, multiplication, data transfer, subtraction, port reading/writing)

2.2.0 To understand interrupt processing in 8051

- 2.2.1 To describe interrupts in 8051
- 2.2.2 To explain the interrupt types in 8051
- 2.2.3 To explain the steps involved in interrupt processing of 8051
- 2.2.4 To illustrate IE special function register
- 2.2.5 To illustrate IP special function register
- 2.2.6 To state the priority of interrupts in 8051
- 2.2.7 To write simple programs using interupts

MODULE III TIMERS, SERIAL COMMUNICATION

3.1.0 To understand the working of timers

- 3.1.1 To explain the timers in 8051
- 3.1.2 To distinguish between timer function and counter function in 8051
- 3.1.3 To explain TMOD and TCON special function registers
- 3.1.4 To explain different modes of operation of timers
- 3.1.5 To write simple delay programs using timer

3.2.0 To understand serial communication

- 3.2.1 To state the basics of serial communication
- 3.2.2 To explain about serial data transmission and reception in 8051
- 3.2.3 To explain different serial data transmission modes
- 3.2.4 To illustrate SCON special function register
- 3.2.5 To illustrate PCON special function register
- 3.2.6 To write simple programs based on serial communication in 8051

MODULE IV INTERFACING OF 8051

4.1.0 To understand interfacing of 8051

- 4.1.1 To explain the interfacing of LCD system with 8051
- 4.1.2 To explain the interfacing of 4x4 keyboard with 8051
- 4.1.3 To explain the interfacing of 8051 with ADC and DAC
- 4.1.4 To explain the interfacing of stepper motor with 8051
- 4.1.5 To describe the interfacing of dc motor speed control with 8051
- 4.1.6 To explain the interfacing of water level indicator system with 8051
- 4.1.7 To explain the interfacing of temperature control system with 8051

CONTENTS

MODULE I

Comparison of microprocessor and microcontroller - features of 8051 - internal architecture - pin functions - comparison of different versions from 8031 to 8051 - data memory and program memory organization - port architecture

MODULE II

Assembly language programming of 8051 - addressing modes - instruction set - simple programs (program for addition, multiplication, division, data transfer, subtraction, port reading/writing) - interrupts in 8051 - interrupt types - steps in interrupt processing - IE special function register - IP special function register - priority of interrupts

MODULE III

Timers in 8051 - timer function and counter function - TMOD and TCON special function registers - different modes of operation of timers - simple delay programs using timer - serial communication - basics - serial data transmission and reception - different serial data transmission modes - SCON and PCON special function registers - simple programs based on serial communication

MODULE IV

Interfacing with 8051 - LCD system - 4x4 keyboard - ADC and DAC - stepper motor - dc motor - water level indicator system - temperature control system

TEXT BOOK

1. Subratha Ghoshal – 8051 microcontroller internals, instructions, programming and interfacing - Pearson.
2. Muhammad Ali Mazidi and Janice Gillispie Mazidi - The 8051 Microcontroller and Embedded Systems Using Assembly and C - Pearson Education- Second Edition.

REFERENCE

1. Kenneth J Ayala - The 8051 Microcontroller - Thomson - Third Edition.

COURSE TITLE : PROGRAMMING IN C
COURSE CODE : 4044
COURSE CATEGORY : B
PERIOD /WEEK : 4
PERIOD / SEMESTER : 56
CREDITS : 4

TIME SCHEDULE

MODULE	TOPICS	PERIODS
1	Programming Concepts in C	14
2	Arrays	14
3	Pointers and strings	14
4	Functions	14
TOTAL		56

MODULE I

1.1.0 To apply programming concepts in C

1.1.1 Demonstrate output functions and input function for a simple application
1.1.2 Illustrate the structure of a C program with example.
1.1.3 Discuss the concept of identifiers -Variable.
1.1.4 Discuss the data types, qualifiers-long, short, double, signed, unsigned etc
1.1.5 Explain different operators.
1.1.6 Write programs to solve simple arithmetic problems.
1.1.7 Discuss the selection structures – two way and multi way.
1.1.8 Solve problems using two way and multi way selection structures (if, if .. else, switch).

MODULE II

2.1.0 To apply iterative control structures

2.1.1 Discuss the looping(repetition) structures –entry controlled, exit controlled
2.1.2 Discuss the counter controlled loop.
2.1.3 Solve the problems using looping structures(while, do.. while, for)

2.2.0 To know about arrays.

2.2.1 Explain how one dimensional array can be created.
2.2.2 Illustrate the array operations- like insertion, deletion, searching, sorting, largest/smallest/second largest, sum/average.
2.2.3 Explain how two dimensional arrays can be created.
2.2.4 Illustrate the two dimensional array operations.

MODULE III

3.1.0 To apply Pointers and Strings

- 3.1.1 Describe pointer and pointer arithmetic
- 3.1.2 Write programs to apply pointers
- 3.1.3 Explain how strings are handled in C
- 3.1.4 Write programs for string manipulations

MODULE IV

4.1.0 To apply Functions

- 4.1.1 Explain how user defined functions can be defined and used.
- 4.1.2 Write programs to illustrate the use of user defined functions
- 4.1.3 Illustrate array operations using functions
- 4.1.4 Differentiate call by value and call by reference
- 4.1.5 Illustrate array operations using pointers.
- 4.1.6 Describe Recursion.

COURSE CONTENTS

MODULE I PROGRAMMING CONCEPTS IN C

Output functions and input function for a simple application - Structure of a C program - Variables and Constants - Data types and type qualifiers (long, short, double, signed, unsigned etc) – Operators (Arithmetic, relational, logical, increment/decrement, conditional, assignment, bit wise etc) – Writing simple programs for the evaluation of arithmetic expressions

Selection structures – two way and multi way. - Solve problems using if, if .. else and switch.

MODULE II ITERATIVE CONTROL STRUCTURES AND ARRAYS

1. Looping (repetition) structures –entry controlled, exit controlled- while, do..while- Counter controlled loop – for loop – Programming using looping structures(while, do.. while, for) - Nested Looping.
2. Array - Array operations- insertion, deletion, searching, sorting, largest/smallest/second largest, sum/average, reverse the array. - Two dimensional array - two dimensional array operations- transpose of a matrix, checking the symmetric matrix, sum of elements, row sum, column sum, diagonal sum, matrix addition and matrix multiplication.

MODULE III POINTERS AND STRINGS

Pointer and pointer arithmetic - Programs to apply pointers - Strings – Declaring & Initialising string variables, Reading & writing strings from variables, Comparison of two strings, String handling functions – Programs for string manipulations

MODULE IV FUNCTIONS

Definition of Functions - Standard Library of C functions - Prototype of a function: Formal parameter list - Return Type - Function call - Passing arguments to a Function: call by

value, call by reference - arrays as function arguments. Array operations using pointers.- Recursion.

TEXT BOOK:

1. Programming in C – Ashok N. Kamthane, Pearson education

REFERENCE BOOKS:

1. Programming in C -second edition – R. Subburaj, - Vikas Publishing House.

COURSE TITLE : LINEAR INTEGRATED CIRCUITS LAB
COURSE CODE : 4047
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER : 84
CREDITS : 3

LIST OF EXPERIMENTS

On completion of the course, the student will be able:

1. To construct and test electronic circuits using linear ICs

1.1 To design and setup (i) Voltage follower (ii) Inverting amplifier and (iii) Non-inverting amplifier circuits using Op-Amp 741 and

(i) Plot the I/O waveforms

(ii) Measure the gain

(iii) Find out the phase difference between input and output

1.2 To setup (i) Summing amplifier and (ii) Difference amplifier circuits using Op-Amp 741 and verify the output

1.3 To setup (i) Zero crossing detector (ii) Schmitt trigger circuits using Op-Amp 741 and

(i) Plot the I/O waveforms

(ii) Measure the V_{UT} and V_{LT} of the Schmitt trigger

1.4 To setup (i) Differentiator and (ii) Integrator circuits using Op-Amp 741 and plot their pulse response

1.5 To construct symmetrical and asymmetrical astable multivibrators using Op-Amp 741 and

(i) plot the waveforms

(ii) Find out the frequency of oscillation

1.6 To setup a monostable multivibrator using Op-amp 741 and

(i) Plot the waveforms

(ii) Measure the time delay

1.7 To setup a RC phase shift oscillator using Op-Amp 741 and

(i) Plot the output waveform

(ii) Measure the frequency of oscillation

1.8 To construct a Wien bridge oscillator using Op-Amp 741 and

(i) Plot the output waveform

(ii) Measure the frequency of oscillation

1.9 To setup symmetrical and asymmetrical astable multivibrators using IC 555 and

(i) Plot the output waveform

(ii) Measure the frequency of oscillation

1.10 To construct a monostable multivibrator using 555 IC and

(i) Plot the output waveform

(ii) Measure the time delay

1.11 To setup a voltage controlled oscillator using IC 566 and plot the waveforms

1.12 To setup a low voltage regulator using IC 723 and plot the regulation characteristics

1.13 To construct a +5V, 1A power supply using IC 7805

1.14 To construct a variable power supply using LM 317

1.15 To construct a dual power supply using LM 320 and LM 340

COURSE TITLE : MICROCONTROLLER AND INTERFACING LAB
COURSE CODE : 4048
COURSE CATEGORY : A
PERIODS/WEEK : 6
PERIODS/SEMESTER : 84
CREDITS : 3

LIST OF EXPERIMENTS

On completion of the course, the student will be able:

1. To understand microcontroller programming

1.1 To familiarize with microcontroller kit
1.2 To write an ALP to multiply two 8 bit numbers
1.3 To write an ALP to divide two numbers
1.4 To write an ALP to find sum of a block of N numbers
1.5 To write an ALP to transfer a block of N data
1.6 To write an ALP to find number of occurrence of a data in an array
1.7 To write an ALP to find the largest / smallest data in an array
1.8 To write an ALP to sort an array in ascending / descending order
1.9 To write an ALP to convert BCD to Hex / Hex to BCD
1.10 To write an ALP to convert Binary to ASCII / ASCII to Binary
1.11 To write an ALP to generate a square wave
1.12 To write an ALP to implement counter using timer
1.13 To write an ALP to program using interrupt

2. To understand interfacing of microcontroller

2.1 To write an ALP to interface digital I/O
2.2 To write an ALP to interface matrix keyboard
2.3 To write an ALP to interface seven segment displays
2.4 To write an ALP to interface LCD Displays
2.5 To write an ALP to interface traffic light
2.6 To write an ALP to interface 8 bit ADC
2.7 To write an ALP to interface 8 bit DAC
2.8 To write an ALP to interface stepper motor control
2.9 To write an ALP to interface DC motor control
2.10 To write an ALP to interface sending data through serial port of controller

COURSE TITLE : PROGRAMMING IN C LAB
COURSE CODE : 4049
COURSE CATEGORY : B
PERIODS/WEEK : 6
PERIODS/SEMESTER : 84
CREDITS : 3

Hardware Requirement : Desk Top Computer.

Software Requirement : Linux Operating System with GCC

OBJECTIVES

At the end of the Course, the students will be able to:

- Develop the logic to solve the given problem.
- Understand the concepts of constants, variables, data types and operators.
- Develop programs using input and output operations.
- Write programs using decision control structures in C.
- Write programs using loop control structures in C.
- Write programs using case control structures in C.
- Write programs based on arrays.
- Write Programs using string handling functions.
- Write programs using user-defined functions.
- Write programs using structures
- Write programs using the concept of Pointers.

1. **<u>To apply programming concepts in C</u>**

    a. Demonstrate output functions and input function for a simple application.
    b. Write programs for simple expression evaluation.

Create a Sample application for inputting details such as regno, branch code, semester and 5 marks of a student, calculate and display total mark along with student details.

    c. Write programs using simple if statement.
    d. Write programs using if..else, elseif and nested if.
    e. Write programs using switch statement.

Sample Experiment : Modify the sample application to calculate and display the grade **based on the total mark along with student details.**

2. **<u>To apply Looping controls and arrays</u>**

a. Write programs using while, do..while and for statements.

Sample Experiment :: Modify the sample application to calculate and display the details along with the total mark and grade of 'n' number of students.

b. Write programs using one dimensional array.
c. Write programs to perform one dimensional operations like Insert, delete, search, sort, largest, smallest, second largest, and compute sum and average of array elements.
d. Write programs using two dimensional arrays.
e. Write programs to perform two dimensional array operations like Transpose of a matrix, checking of symmetric matrix, sum of elements of matrix, row sum, column sum, sum of diagonal elements, matrix addition, matrix multiplication

Sample Experiment :: Modify the sample application to store the details of 'n' students into multiple arrays, calculate and display the total mark along with the student details in the order of total mark.

3. **To apply Pointers and Strings**

a. Write programs to apply pointers
b. Write programs for string manipulations

Sample Experiment :: Modify the sample application to store the details of 'n' students with following data elements regno, name (character array), branch, semester and 5 marks (integer array) and display student details along with total mark and grade based on boundary conditions.

4. **To apply Functions**

a. Write simple programs based on library functions
b. Write programs to illustrate 'User-defined functions"
c. Write Function subprograms using arrays and pointers
d. Write Function subprograms to illustrate array as argument
e. Write Function subprograms to Illustrate pointers as arguments

Sample Experiment :: Modify the sample application to store the details of n number of students in multiple arrays with following data elements – regno, name, branch, semester and 5 marks and display the student details along with total mark and grade based on boundary condition. Use function for grade calculation. Display the output with proper headings and format.

f. Write programs to illustrate structure

Sample Experiment :: Modify the sample application by creating a structure named student details and display above mentioned students details